MINERALOGICAL ABSTRACTS

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Notices of Books.

SHAND (S. J.). *Eruptive rocks : their genesis, composition, classification, and their relation to ore-deposits, with a chapter on meteorites.* London (Thomas Murby & Co.) & New York (D. Van Nostrand Co.), 1927, xx + 360 pp., 2 pls., 42 text-figs. Price 20*s*.

This readable and very suggestive book is one that should be carefully considered by all petrographers, although some may not be able to agree with the author's views. A noteworthy attempt is made to put aside some of the existing confusion in the nomenclature, and the author outlines 'a system of petrography' without introducing a host of new terms to add still further to the chaos. This system is based on the idea of oversaturated, saturated, and undersaturated rocks [with respect to silica] as put forward by the author in 1913 [a claim to priority in this, dating from 1890, has been made by F. Y. Levinson-Lessing, Abstr., vol. 3, p. 193]. The classification depends on the quantitative mineralogical composition as determined by micrometric analysis ; but as this can be applied only to the 'eucrystalline' rocks the author has to fall back on calculations from chemical analyses in the case of the 'dyscrystalline' rocks. *Oversaturated rocks* include : *A*, Granites, granodiorites, rhyolites, and rhyodacites ; *B*, Tonalites and dacites. *Saturated rocks* : *A*, Syenites, akerites, trachytes, and trachyandesites ; *B*, Shonkinites and monzonites ; *C*, Diorites and andesites ; *D*, Gabbros and basalts ; *E*, Perknites. *Undersaturated rocks* (Division I) : *A*, Sub-syenites and sub-trachytes ; *B*, Sub-diorites and sub-andesites ; *C*, Sub-gabbros and sub-basalts ; *D*, Sub-perknites ; (Division II) : *Ia*, Leucite-syenoids and leucite-phonolites ; *Ib*, Soda-syenoids and soda-phonolites ; *II a*, Dioroids (essexites) and tephrites ; *II b*, Gabbroids (theralites) and basanites. Each of these groups is further divided into peraluminous, metaluminous, subaluminous, and peralkaline types. As an example, the corundum-bearing 'plumasite' and 'dungannonite' are classed as peraluminous subdiorites. Stress is laid on the volatile constituents of magmas ; and as pegmatites may grade into quartz-veins, the term 'igneous' is replaced by

'eruptive' as applied both to rocks and certain ore-deposits. There are special chapters on Eruptive ore-deposits and on Meteorites. The book contains a good many misprints and minor errors, and it will no doubt be much improved in a second edition. L. J. S.

Rosenbusch (H.). *Mikroskopische Physiographie der Mineralien und Gesteine.* Band I, zweite Hälfte, spezieller Teil: *Die petrographisch wichtigen Mineralien.* 5th edit., by O. Mügge. Stuttgart (E. Schweizerbart), 1927, Lieferung 3, xv + pp. 555–814, 15 pls., 83 text-figs., and 17 tables. Price 33 Mk. [See Abstr., vol. 2, p. 413; vol. 3, pp. 1, 159.]

This part completes the second half of volume one of this work. The minerals dealt with include, among others, the micas, chlorites, epidote, and all the felspars. A special section of twenty-seven pages is devoted to methods of determining the composition of plagioclase, and eight of the plates represent projections of the optic axes and axes of elasticity on the plane perpendicular to *c* for felspars of various composition. The application of universal stage methods to the determination of plagioclases is not discussed. Seventeen tables at the end of the book give the physical and chemical properties and mode of occurrence of 226 rock-forming minerals somewhat on the lines of the tables issued with Weinschenk's 'Die gesteinsbildenden Mineralien'. The preparation of the book was commenced in 1924, and the author has been able to include references to some papers published in 1925 but not to more recent work. The bibliographies seem to be very complete as regards German literature, but some quite important papers published outside Germany have been omitted. Dr. Mügge is to be congratulated on the completion of this valuable book of reference, and the publishers on its production.

W. C. S.

Honess (Arthur P.). *The nature, origin and interpretation of the etch figures on crystals.* New York (J. Wiley & Sons) & London (Chapman & Hall), 1927, xiii + 171 pp., 1 pl., 109 text-figs. Price 17*s.* 6*d.*

The author has for several years made a special study of the etch-figures on the faces of crystals [Abstr., vol. 1, pp. 308–309], and the present book was written as a degree thesis at Princeton University. The work of H. Baumhauer, F. Becke, and others is reviewed and discussed, and new observations are recorded in detail for ten minerals, the etch-figures of these being illustrated by many excellent photomicrographs

and line-drawings. Cuprite, apophyllite, and topaz, as well as baryte, celestine, and anglesite are definitely holohedral; wulfenite is tetragonal-bipyramidal (on p. 98 'equatorial', but on p. 164 'pyramidal'); apatite and endlichite hexagonal-bipyramidal; and tourmaline ditrigonal-pyramidal. Cases in which there is a lack of agreement between the evidence of symmetry afforded by etching and by physical (pyroelectric and rotatory polarization) and X-ray methods are discussed. Etch-figures on any one crystal-face vary in form during their growth; and the final form is dependent on the nature of the etching agent, and on its concentration and temperature. Immature etch-figures may show anomalies; the curious 'beaks' are specially described. L. J. S.

Niggli (Paul). *Tabellen zur allgemeinen und speziellen Mineralogie.* Berlin (Borntraeger), 1927, xvi + 300 pp., 228 figs. Price 9·30 Mk.

This gives in a condensed and tabular form with numerous outline drawings much of the information contained in the same author's 'Lehrbuch der Mineralogie' [Abstr., vol. 2, p. 365; vol. 3, p. 221]. Minerals are now arranged according to crystal-systems. In the determinative tables fluorite appears under the octahedral type [hexahedral type in the 'Lehrbuch'] of the cubic system; and if a student were presented with a common cube of this mineral he might consequently fail to recognize it. Tenorite [in the 'Lehrbuch' classed with 'crystals of the cubic or hypocubic type'] now appears in the determinative tables under monoclinic and triclinic crystals; but in any case it would be practically impossible for an elementary student to determine this mineral crystallographically. L. J. S.

Fox (Cyril S.). *Bauxite. A treatise discussing in detail the origin, constitution, known occurrences, and commercial uses of bauxite: and including particulars regarding the present condition of the aluminium industry and the peculiar importance of cryolite in the extraction of aluminium from bauxite.* London (Crosby Lockwood & Son), 1927, xii + 312 pp., 1 pl., 32 text-figs. Price 30*s*.

The scope of this book is fully set out on the title-page as quoted above. Lateritic bauxite and 'terra rosa' are also included. It is largely a compilation, bringing together a large amount of useful information from various scattered sources. The information collected is in most cases very much to the point and appears to be reliable, but we were somewhat surprised to find as the first figure in the text a fine picture of

the Kaieteur Falls in British Guiana. Unfortunately, these enormous falls are far removed across difficult country from the important bauxite deposits of the colony—but no doubt the author has future possibilities in view. The book is well and clearly printed, though not altogether free from misprints. A good bibliography is added. L. J. S.

Plattner (Carl Friedrich) [1800–1858]. *Probierkunst mit dem Lötrohre.* 8th edition by F. Kolbeck. Leipzig (J. A. Barth), 1927, xvi + 500 pp., 72 figs. Price Rm. 21.50 (bound, Rm. 24).

The eighth edition of this well-known book, which was first published in 1835, has recently appeared, revised and enlarged by Dr. F. Kolbeck. As might be expected, the general methods are little altered, the chief additions to the book being descriptions of the behaviour before the blowpipe flame of many of the recently discovered minerals. An exhaustive discussion of apparatus and reagents is given. Perhaps owing to the very simple nature of the apparatus this is not necessary, but some of the details of the reagents, especially the more uncommon ones, must prove very useful. A series of general preliminary tests is described, and is followed by a section dealing with more special tests for the elements, both in the free state and in their more common compounds. The reactions of the rare-earths are given very fully, though it is interesting to note that neodymium and praseodymium are treated as the one element didymium. Blowpipe tests can be extended to a quantitative technique, and this has been done in the case of the more important metals. The book concludes with a long index of minerals, artificial products, and smelting products. It is very clearly printed on good paper, and cheap for the large mass of information it contains.

G. Greenwood.

[Belyankin (D. S.), Nizkovsky (P. L.) & Preobrazhensky (I. A.)] Белянкин (Д. С.), Низковский (П. Л.) и Преображенский (И. А.). Сборник таблиц для определения минералов. [*Collection of tables for the determination of minerals.*] Ленинград [Leningrad], 1926, vi + 151 pp.

This very useful book contains: I, Tables for the determination of minerals from their external characters (lustre, hardness, and colour). II. Blowpipe analysis. III, Specific gravity. IV, Refractive indices. V (pp. 107–151), gives a short description of the minerals, alphabetically arranged, that are mentioned in the tables. P. N. C.

Crystal-optics.

Kołaczkowska (Marja). *Uwagi o wyznaczaniu współczynnika załamania światła metodą pryzmatu.* [French résumé:] *Aperçu sur la détermination de l'indice de réfraction par la méthode du prisme.* Arch. Prac. Min. Tow. Nauk. Warszaw. (Arch. Lab. Min. Soc. Sci. Varsovie), 1926, vol. 1 (for 1925), pp. 9–24 (Polish), pp. 25–27 (French), 2 figs.

The relations between the prism angle (α), angle of minimum deviation (δ), and refractive index (n) are tabulated and plotted on curves. With increasing δ, α reaches a maximum value, which ranges from 77° 20′ for $n = 1{\cdot}6$ to 100° 30′ for $n = 1{\cdot}3$. The more accurate results are obtained when the prism angle approaches this maximum value for the particular substance. As an example, n was determined with eight prisms of fluorite with α ranging from 31° 53′ to 87° 40′, and the errors are recorded. L. J. S.

Woyno (Tadeusz Jerzy). *O oznaczeniu graficznem kąta osi optycznych w metodzie Fedorowa.* [French résumé:] *Sur un procédé graphique pour la déterminaison de l'angle des axes optiques appliqué à la méthode de Fedoroff.* Arch. Prac. Min. Tow. Nauk. Warszaw. (Arch. Lab. Min. Soc. Sci. Varsovie), 1926, vol. 1 (for 1925), pp. 163–171 (Polish), p. 172 (French), 4 figs.

Woyno (T. J.). *Über die Bestimmung des Winkels der optischen Achsen bei der Fedorowschen Methode.* Zeits. Krist., 1926, vol. 63, pp. 284–290, 5 figs.

Formulae connecting the optic axial angle with the extinction-directions have been given by M. Berek [Abstr., vol. 2, p. 365]. A graphical method is now given for obtaining the optic axial angle from the extinction-directions and the principal optical vectors, these having been determined on the Fedorov table and marked on a stereographic net. A graph plotting optic axial angle against extinction-angles is given. L. J. S.

Cesàro (G.). *Action du biseau de quartz sur une lame normale à la bissectrice obtuse, en lumière convergente.* Bull. Cl. Sci. Acad. Roy. Belgique, 1925, pp. 204–221, 3 figs.

Formulae are given for comparing the effects of a quartz-wedge on a thin crystal section cut normally to the acute bisectrix, normally to the obtuse bisectrix, or parallel to both; with special reference to the problem of determining the sign of the birefringence. H. H.

Schatz (Heinrich). *Zur Diskussion der Fresnelschen Helligkeitsformel für planparallele Schnitte eines Kristalles zwischen senkrecht gekreuzten Nikols.* Zeits. Krist., 1925, vol. 62, pp. 320–324, 5 figs.

The Fresnel formula for the intensity of light passed through a crystalline plate and crossed nicols is considered in detail with special reference to the case in which this intensity remains zero when the plate is rotated.

H. H.

Mell (Maria). *Brechung und Absorption des Lichtes in der Zinkblende bei Temperaturen bis zu 700°.* Zeits. Physik, 1923, vol. 16, pp. 244–265, 4 figs.

Numerous determinations of the refractive index by the prism method are given for pale-coloured blende from Santander, for many wave-lengths (732–405 $\mu\mu$.) and over a considerable range of temperature (−138° to +706° C.). At about 20° C. for sodium-light two prisms gave 2·3682 and 2·3684. The index increases with the temperature and at a quicker rate for the shorter wave-lengths. Transparency increases with the wave-length and diminishes with rise in temperature.

L. J. S.

Weigel (O.). *Der photochemische Zerfall des Realgars.* Tschermaks Min. Petr. Mitt., 1925, vol. 38, pp. 288–308, 6 figs.

The well-known disintegration of realgar by the action of light to a reddish-yellow powder (consisting of a mixture of As_2S_3 and As_2O_3, with also As_4S_3) is connected with the photo-electrical conductivity of the substance. Detailed determinations were made with orientated prisms and plates of the refractive indices (e.g. α 2·238, β 2·684, γ 2·704 for wave-length 590 $\mu\mu$.), absorption of light, and of the electrical conductivity when the crystal is exposed to light of different wave-lengths. The electrical conductivity plotted against wave-lengths gives curves showing high peaks at 530 and 550 $\mu\mu$. (green and greenish-yellow) for the α and γ vibrations respectively. Fragments of realgar exposed to direct sunlight for 112 hours behind screens of glass of various colours showed the greatest change with a green glass the maximum transparency of which was near 520 $\mu\mu$. It is concluded that the photochemical disintegration of realgar is due to the separation of electrons and the loosening of the atomic bonds, thus favouring oxidation of the arsenic.

L. J. S.

Wallerant (Fred.). *Sur un cas intéressant de dispersion tournante.* Bull. Soc. Franç. Min., 1923, vol. 46, pp. 44–49.

Unstable racemate crystals, prepared by mixing solutions of the soda-potash and soda-ammonia racemates, appear to be orthorhombic like the tartrates, though not measurable. An apparent basal section shows a biaxial figure with marked crossed dispersion, besides a dispersion of the optic axes, these properties varying with the composition. These oblique crystals in time spontaneously become orthorhombic with crossed axial plane dispersion. They may be considered either as mixed racemates altering to tartrates, or else as mixed tartrates with optically anomalous properties due to internal strain. [Cf. Min. Mag., vol. 20, p. 159.]

E. D. M.

Wallerant (Fred.). *Sur la nature de certaines dispersions tournantes.* Bull. Soc. Franç. Min., 1924, vol. 47, pp. 6–8.

That the crystals described in the previous abstract are really tartrates under stress receives support from the fact that when potash-soda tartrate is mixed with lithia-ammonia tartrate two series of mixed crystals are formed, the series rich in lithia showing no crossed-dispersion. Moreover, this phenomenon of crossed-dispersion is best produced in tartrates which have crystallized rapidly. E. D. M.

Winchell (A. N.) & Emmons (R. C.). *Some methods for determining refractive indices.* Amer. Min., 1926, vol. 11, pp. 115–118, 2 figs.

The dispersion method of H. E. Merwin (1922) for the determination of refractive indices (see Min. Mag., vol. 20, p. 108) is employed, not only with light of different colours, but also at different temperatures. A water circulation cell providing a temperature range of 40° C. is placed on the microscope stage, and the refractometer is heated by the same amount to determine the dispersion of the liquid used. With this method fewer liquids are required, and under favourable conditions it is possible to determine all the indices for sodium-light of a mineral grain immersed in a single liquid. L. J. S.

Physical Properties.

Johannsen (Albert) & Phemister (T. C.). *A note on the elasticity of some minerals and its measurement.* Journ. Geol. Chicago, 1925, vol. 33, pp. 268–271, 1 fig.

In the Glaston rebound tester, as used for determining the elasticity of metals, a small ball of hard steel falls from a certain height on to the

surface to be tested, and the height of rebound is given as a percentage of the distance of the fall. On this scale hard steel (at 92) is exceeded by garnet 97, prism face of quartz $95\frac{1}{2}$, pyrite 95, pyramid face of quartz $>93\frac{1}{2}$, fluorite 93, obsidian 93. Other values are labradorite 90, aragonite >74, calcite $73\frac{1}{2}$, haematite $>72\frac{1}{2}$, gypsum $32\frac{1}{2}$. For the higher values the elasticity of the ball comes into account, and still higher values would no doubt be obtained by using balls of the same material as that tested. L. J. S.

Bechterew (P.). *Analytische Untersuchung des verallgemeinerten Hookeschen Gesetzes. Anwendung der Methode der Koordinatentransformation.* Zeits. Krist., 1925, vol. 62, pp. 223–254, 1 fig.

An analytical treatment of the mathematical theory of elasticity. L. J. S.

Bechterew (P.). *Analytische Untersuchung des verallgemeinerten Hookeschen Gesetzes. Anwendung der Lehre von der potentiellen Energie und dem Prinzip der minimalen Arbeit.* Zeits. Krist., 1926, vol. 64, pp. 373–399.

The principles of least action and conservation of energy are used to determine the elastic properties of crystals or other solid non-isotropic media, especially to find the limits between which the elastic constants must lie. The general theory is adapted to the case of symmetric media, and applied to Poisson's and other practical elastic constants. Finally, the theory is tested by the results of experiments on steel, pyrite, and beryl. H. H.

Geller (A.). *Zur Kenntnis des Fließdruckes fester Körper.* Zeits. Krist., 1925, vol. 62, pp. 395–412, 6 figs. [Cf. Abstr., vol. 2, p. 490.]

An account is given of experiments determining the pressure which causes halite and sylvine to flow out of a hole. The graphs shown in the figures explain how this pressure varies with the temperature, diameter of the hole, mechanical state of division of the substance, &c. The author also replies to criticisms made by F. Rinne against earlier work of O. Mügge and himself. H. H.

Rinne (Friedrich). *Vermerke zu A. Geller: Zur Kenntnis des Fließdruckes fester Körper.* Zeits. Krist., 1925, vol. 62, pp. 412–414, 1 fig.

The author maintains that his criticism of A. Geller's earlier work was justified H. H.

Rinne (Friedrich). *Über das Fließen fester Stoffe, insbesondere der natürlichen Salze.* Zeits. Krist., 1925, vol. 61, pp. 389–424, 24 figs.

A review of the literature on the plastic deformation of crystalline material, with special reference to the deformation of halite and sylvine, and application to salt-deposits. L. J. S.

Laue (M. *v.*). *Nachweis der Piezoelektrizität von Kristallen durch Schwingungen im hochfrequenten elektrischen Wechselfeld.* Zeits. Krist., 1926, vol. 63, pp. 312–315.

A rod of quartz placed in a plate condenser with an oscillating electric field undergoes corresponding oscillations in its length. These in turn create oscillations in the strength of the field owing to the piezo-electricity of the quartz. By suitable adjustment of the periodicity of the field to that of the elastic vibration of the crystal a resonance effect is produced by which the phenomenon may be detected. Methods for such detection are described, three due to W. G. Cady [Abstr., vol. 3, p. 189] and one to E. Giebe and A. Scheibe (1925). Qualitative experiments were conducted on thirty-two substances, whose symmetry was consistent with piezo-electric phenomena. The piezo-electric effect was noticeable in all but five cases. H. H.

Kaye (G. W. C.) & Higgins (W. F.). *The thermal conductivity of vitreous silica, with a note on crystalline quartz.* Proc. Roy. Soc. London, Ser. A, 1926, vol. 113, pp. 335–351, 6 figs.

The thermal conductivity of silica-glass ranges from 0·0033 c.g.s. units at 60° C. to 0·0036 at 240°. The conductivity of crystallized quartz is much greater, and is higher along the optic axis; further, it diminishes with rise in temperature.

	Temp.		Conductivity.
Parallel optic axis	68·1° C.	...	0·0222 c.g.s.
	104·3	...	0·0186
Perpendicular optic axis ...	70·4	...	0·0129
	105·5	...	0·0116

L. J. S.

Schulz (Karl). *Numerische Angaben über physikalische und chemische Eigenschaften der Mineralien. C. Die Wärmeleitung in Mineralien, Gesteinen und den künstlich hergestellten Stoffen von entsprechender Zusammensetzung.* Fortschr. Min. Krist. Petr., 1924, vol. 9, pp. 345–411.

A summary of the literature and tabulation of data on the thermal conductivity of minerals and rocks and allied substances. [Cf. Abstr., vol. 1, p. 368.] L. J. S.

Webster (W. L.). *Magneto-striction in iron crystals.* Proc. Roy. Soc. London, Ser. A, 1925, vol. 109, pp. 570–584, 5 figs.

The phenomenon of magneto-striction, or change in dimensions of a body when magnetized, was discovered by Joule in 1847. Rods were cut from single crystals of pure iron parallel to the tetrad, triad, and diad axes (the crystals being orientated by means of X-rays). The [100] axis showed an increase in length ($dl/l + 10^6$ up to about 20 shown on the curves) for all values of the magnetization; along the [111] there was always a decrease in length (to -12); and along the [110] axis increase in length occurred for weak fields, followed by a decrease when magnetic saturation was approached. A reciprocal relation between magneto-striction and the effect of stress on magnetization was determined. Details are given of the method and apparatus employed.

L. J. S.

Chemical Crystallography.

[Boldyrev (A. K.)]. Болдырев (А. К.). Комментарии к работе Е. С. Федорова: *Das Krystallreich.*—Boldirew (A. K.). *Kommentarien zum Werk von E. S. Fedorov*: „*Das Krystallreich*". Leningrad (Acad. Sci.), 1926, 72 pp. (Russ. with Germ. résumé, p. 72.)

The introduction to Fedorov's 'Crystal kingdom' [Abstr., vol. 2, p. 100] is so written that from the book itself it is not possible to understand his method of crystallo-chemical analysis. The author explains doubtful passages in this introduction and gives supplementary explanations for the instruction of the reader. References are given to the literature in which the method has been mentioned.

P. N. C.

Goldschmidt (V. M.) [& others]. *Geochemische Verteilungsgesetze der Elemente.*[1] *VII. Die Gesetze der Krystallochemie.* Skrifter Norske Vidensk.-Akad. I. Mat.-nat. Kl., Oslo, 1926, no. 2, 117 pp., 5 figs.

—— —— *VIII. Untersuchungen über Bau und Eigenschaften von Krystallen.* Ibid., 1927, no. 8 (for 1926), 156 pp.

—— *Die Gesetze der Krystallochemie.* Die Naturwissenschaften, 1926, vol. 14, pp. 477–485.

—— *Krystallbau und chemische Zusammensetzung.* (Zusammenfassender Vortrag.) Ber. Deutsch. Chem. Gesell., 1927, vol. 60, pp. 1263–1296, 7 figs.

VII. An elaboration of previous papers [Abstr., vol. 3, pp. 181, 261] dealing with the size of atoms (or ions) and their mutual deformation in

[1] In this series of papers on the 'Geochemical laws of distribution of the elements', the first of which was unnumbered [Abstr., vol. 2, p. 159], the scope of the investigation appears to be gradually changing.

crystals, with applications to isomorphism, polymorphism, and morphotropy. Several general laws are laid down. Some of the atomic radii employed are: Na^+ 0·98, Na° [neutral atom] 1·86, K^+ 1·33, K° 2·23, F^- 1·33, H^- 1·27, O^{--} 1·32, O° 0·60, S^{--} 1·74, S° 1·04, Te^{--} 2·03, Te° 1·33, Te^{++++} 0·89, Mg^{++} 0·78, Mg° 1·62, Ca^{++} 1·06, Ca° 2·21, Be^{++} 0·34, Be° 1·05, Fe^{++} 0·83, Fe° 1·26, Fe^{+++} 0·67, Al^{+++} 0·57, Al° 1·43, Si^{++++} 0·39, Si° 1·18 Å., &c. [cf. Abstr., vol. 3, p. 342].

VIII. A further theoretical discussion. The fundamental law of crystallochemistry reads: The crystal-structure of a substance is controlled by the size and polarization properties of its components; these components being atoms (or ions) and atomic groups. An appendix gives a bibliography of 45 papers recently (1923–26) published by the author and his co-workers, and tabulates the numerous X-ray crystal data obtained. Even with this aid, it is difficult to select for a brief abstract what is really new from the mass of detail presented in this series of papers. The last two papers quoted above are abbreviated repetitions. L. J. S.

Barth (Tom.) & Lunde (Gulbrand). *Beiträge zur Kenntnis der Mischkristalle.* Zeits. Physik. Chem., 1926, vol. 122, pp. 293–334, 8 figs.

The systems CuI—AgI, CuCl—AgCl, AgBr—AgI, TlBr—TlI, &c., were examined by X-ray methods, and some further details are now given [Abstr., vol. 3, p. 180]. L. J. S.

Chudoba (Karl). *Über einen vermutlichen Zusammenhang zwischen der Verzwillingung und dem Atombau der Bestandteile gewisser regulärer Kristalle heteropolarer Verbindungen.* Zeits. Krist., 1927, vol. 65, pp. 133–139, 2 figs.

The attempt to account for the occurrence of twins in crystals in the cubic system by means of their structure leads to a negative result. With the possible exception of sylvine, compounds of those elements whose position in the periodic system is close to that of the gases He, Ne, A, Kr, X, Em are characterized by absence of twinning. H. H.

Kerr-Lawson (D.). *Crystallographic and optical comparison of the chlorides of lead isotopes.* Univ. Toronto Studies, Geol. Ser., 1926, no. 22, pp. 37–43, 2 figs.

Measurements were undertaken to ascertain whether crystals of lead chloride ($PbCl_2$) prepared from lead from different sources showed any difference in their crystallographic and optical constants. Crystals were

prepared from (1) lead (at. wt. 206·1) extracted from pitchblende from Katanga, (2) ordinary lead, (3) lead extracted from thorite from Brevig, Norway. The axial ratios $a : b : c$ were determined as 0·5950 : 1 : 1·1875, 0·5949 : 1 : 1·1871, and 0·5948 : 1 : 1·1869 respectively. The refractive index γ determined with a prism bounded by natural crystal-faces varied from 2·2601 to 2·2604 at 20° C. [for ? light]. These variations are within the range of experimental error, and it is concluded that the three sets of crystals are identical. The crystals used for measurement were grown by slowly cooling a saturated solution of the salt in hot strong hydrochloric acid ; they are pyramidal in habit with large basal plane. Crystals grown by slowly cooling from 175° C. an aqueous solution under pressure were prismatic along the a-axis with domes and basal plane and very small pyramidal faces. L. J. S.

Wallerant (Fred.). *Sur la diffusion dans les cristaux mixtes.* Bull. Soc. Franç. Min., 1924, vol. 47, pp. 9–12.

The analogy between mixed crystals and liquid mixtures breaks down with the property of diffusion. Azobenzol and dibenzyle or stilbene crystallized in parallel orientation on a microscope slide do not show any diffusion even after three years. Coloration of crystals by impurities is another phenomenon. E. D. M.

Growth and Corrosion of Crystals.

Bentivoglio (Marie). *An investigation of the rate of growth of crystals in different directions.* Proc. Roy. Soc. London, Ser. A, 1927, vol. 115, pp. 59–87, 21 figs.

Crystals of MgAm, FeAm, and MgK sulphates ($R''R'_2(SO_4)_2 . 6H_2O$) grown from solutions contained in a slowly rotating vessel were measured at intervals under the microscope to determine the thickness of material deposited on each face. For this purpose a special crystal-holder with stand was employed. Similar faces grow at the same rate (except when adjacent to a fast-growing face needing a large supply of material) ; and there is a constant ratio between the rate of growth of the faces of any two different forms. From the measured rates of growth ideal forms of development are deduced. In an isomorphous series of salts the relative rates of growth on corresponding faces may be different ; and therefore does not depend on the reticular densities on the faces. Crystals without a centre of symmetry (K and Am tartrates) grow at different rates on opposite parallel faces. L. J. S.

[Shubnikov (A. & O.)] Шубников (А. и О.). Статистическое исследование вициналей октаэдра квасцов.—Šubnikov (A. et O.). *Étude statistique des faces vicinales sur l'octaèdre d'alun.* Труды Мин. Музея Акад. Наук СССР (Trav. Musée Min. Acad. Sci. URSS), 1926, vol. 1, pp. 1–34, 1 pl., 5 text-figs.

Numerous two-circle measurements were made of the vicinal faces on octahedra of potash-alum, but the magnitude of the angles of many of these faces is within the limit of error (6′) of the goniometer used. The frequencies of occurrence of the faces are tabulated. Plotted on a projection they cluster round the three points of a triakisoctahedron at 5′ from the true octahedral position. The average for all the faces thus gives the octahedron face. The number and character of the vicinal faces varies with the conditions of growth of the crystal. P. N. C.

Schubnikow (A.) [= Shubnikov (A.)] & Lämmlein (G.). *Beobachtungen über die Orthotropie des Kristallwachstums.* Zeits. Krist., 1927, vol. 65, pp. 297–303, 8 figs.

Drops of salol, α-naphthylamine, and benzophenone were placed on a microscope slide and covered with a round or square cover-glass. They were then supercooled to room temperature and inoculated with crystalline dust, either at the centre or along the perimeter. The crystal intergrowth which resulted was a symmetrical aggregate, apparently due solely to the geometrical limitation of space at the disposal of the crystals springing out from each centre of growth, and showing no signs of being influenced by any thermal phenomenon, as was suggested by F. Rinne (1926). H. H.

Hrynakowski (Konstanty). *Spostrzeżenia nad rytmicznością krystalizacji ałunu zwyczajnego w układzie metastabilnym.* I.—Observations sur la cristallisation rytmique [*sic*] d'alun ordinaire dans l'état métastabile. *I.* Roczniki Chemji, Warsawa, 1926, vol. 6, pp. 150–154, 2 figs.

Hrynakowski (K.). *Beobachtungen zur rhythmischen Kristallisation von Kalialaun.* Zeits. Krist., 1926, vol. 64, pp. 156–159, 3 figs.

Potash-alum was grown from a supersaturated solution in metastable condition. The crystal showed a series of stratified planes of deposition each differing from its neighbour, some being full of air-bubbles, others consisting of feathery growths perpendicular to the plane of the crystal-face, and so on. H. H.

Terpstra (P.). *Opmerking over het groeien van kristallen.* Verslag Afd. Natuurk. K. Akad. Wetensch. Amsterdam, 1925, vol. 34, pp. 776–778, 2 figs.

—— *An observation on the growth of crystals.* Proc. Sect. Sci. K. Akad. Wetensch. Amsterdam, 1925, vol. 28, pt. 2, pp. 794–796, 2 figs.

A mathematical discussion of Valeton's formula for the rate of growth of crystals [Abstr., vol. 2, p. 326]. L. J. S.

Schwinner (Robert). *Kristallisation und gerichteter Druck.* Tschermaks Min. Petr. Mitt., 1927, vol. 37 (for 1926), pp. 219–235, 1 fig.

A discussion on the growth of crystals under the influence of directed pressure, as in the crystalline schists. L. J. S.

Holzner (Julius). *Über die Aufwachsung der Kristalle.* Zeits. Krist., 1927, vol. 65, pp. 161–203.

A discussion on the grouping of crystals in drusy cavities and their orientation with respect to the point of attachment. For example, quartz crystals usually grow as prisms standing out from the matrix, whilst flat rhombohedra of calcite often grow edgeways. Many other similar examples are enumerated, and hemimorphic and twinned crystals are specially considered. It is thought that the habit and orientation are such that during growth the crystals presented the maximum surface to the mother-liquid. L. J. S.

Gille (F.) & Spangenberg (K.). *Beiträge zur Trachtbeeinflussung des NaCl durch Harnstoff als Lösungsgenossen.* Zeits. Krist., 1927, vol. 65, pp. 203–250, 8 figs.

The influence of metallic chlorides on the habit of sodium chloride crystals was tested in order to clear up discrepancies in results published by other authors. A series of observations was also carried out on solutions of sodium chloride to which a varying amount of urea was added. Such addition lessens markedly the conductivity of the solution, and this diminution cannot be ascribed solely to the increased viscosity of the liquid. The proportional rate of growth of the forms (100), (111), (110) was measured, and found to vary from the ratios 1 : 3·2 : 6·8 in pure water to 1 : 0·25 : 1·9 when 33·5 grams of urea was added to 100 c.c. of solution, thus explaining the octahedral habit of the crystals in the latter case. Some new optical data for the double salt $NaCl . CO(NH_2)_2 . H_2O$ are added. H. H.

Rinne (Friedrich). *Thermotaxie als Problem der orientierten Kristallisation.* Zeits. Krist., 1926, vol. 64, pp. 71–75, 3 figs.

Thermotaxis in biology finds an analogy in the orientated growth of crystals relative to the direction of the conduction of heat. Examples are the growth of large crystals of sodium nitrate (F. Stöber, Abstr., vol. 2, p. 498), and columnar aggregates of periclase formed from fused magnesite, in which the cubic cleavages are arranged parallel and perpendicular to the cooling surfaces. Such parallel aggregates, shown also by 'liquid crystals', are called para-crystals (quasi-crystals). L. J. S.

Himmel (Hans). *Wachstumserscheinungen am Alaun.* Neues Jahrb. Min., Abt. A, 1926, Beilage-Band 54, pp. 88–125, 1 pl., 24 text-figs.

A study of the forms of growth of crystals of potash-alum with many sketches of the surface characters ('growth accessories'). 'Growth pits' with stepped sides are described. L. J. S.

Himmel (Hans) & Schmidt-Zittel (Herbert). *Wachstumsakzessorien am Beryl.* Centralblatt Min., Abt. A, 1927, pp. 118–125, 3 figs.

A detailed description is given of the surface markings ('accessories of growth') on a crystal of aquamarine from Spitzkoppje, Erongo Mts., South-West Africa. It shows the forms $c\,m\,s$ with small $a\,p\,i$ [Dana's letters], and new $H\,(52\bar{7}4)$ and $L\,(7.4.\bar{1}\bar{1}.6)$ as narrow truncations on the edge $[s\,s]$. Several other vicinal faces are noted on the surface markings. On s are small hillocks and pits, all of which are regarded as forms of growth. L. J. S.

Schmidt-Zittel (Herbert). *Calcit aus dem Lötschberg- und Simplontunnel.* Neues Jahrb. Min., Abt. A, 1926, Beilage-Band 54, pp. 72–87, 4 pls.

A description of the forms and surface markings ('growth accessories'), with detailed sketches drawn true to nature, of calcite crystals from the Lötschberg and Simplon tunnels, Switzerland. [Abstr., vol. 2, p. 358.] L. J. S.

Nehmitz (A.). *Zur Theorie der Ätzgrubenbildung.* Zeits. Krist., 1927, vol. 65, pp. 291–296, 4 figs.

The theories of Hettich, Becke, Johnsen, and Gross on the growth of etched figures are considered, especial attention being given to Gross's condition $g_\psi > g\cos\psi$ for the appearance of a face with velocity of growth g_ψ as a side of an etched figure on a face with velocity g inclined to it at an angle ψ. It is pointed out that, even if this condition is satisfied,

physical conditions may prevent the appearance of the etched figures, so that the condition is necessary but not sufficient. H. H.

Aminoff (G.). *Über Verdampfungs- und Lösungserscheinungen bei Zink.* Zeits. Krist., 1927, vol. 65, pp. 23–27, 5 figs. [Cf. Abstr., vol. 2, p. 501.]

A sphere cut from a single crystal of zinc was heated *in vacuo* just below the melting-point. Volatilization of the metal produced a corroded surface showing pits and hillocks and yielding reflections from the positions (0001), (10$\bar{1}$1), (10$\bar{1}$0), (11$\bar{2}$0). From the angle (0001) : (10$\bar{1}$1) = 65° the axial ratio is $a : c = 1 : 1{\cdot}857$. In this experiment the general form of the sphere was not changed. Another sphere was partly dissolved in dilute sulphuric acid and the resulting light-figures plotted at different stages. The rate of solution is greatest ⊥ (11$\bar{2}$0) and least ⊥ (0001), and the solution-form is lemon-shaped with ridges along the zones [(0001), (10$\bar{1}$0)]. L. J. S.

Seebach (M.). *Über Ätz- und Lösungserscheinungen am Korund.* Neues Jahrb. Min., Abt. A, 1926, Beil.-Bd. 54, pp. 420–443, 21 figs.

Polished spheres of artificial corundum were etched for different periods in fused $KHSO_4$, and the light-figures measured on a two-circle goniometer. The spheres are first attacked around the prism-zone, and the final solution-form is a rounded obtuse scalenohedron (21$\bar{3}$4). The decreases in the original diameter of the sphere were normal to (0001) 32 %, (10$\bar{1}$1) 35 %, (10$\bar{1}$0) 13 %, (11$\bar{2}$0) 6 % [Dana's indices]. The indices of the forms of solution are tabulated and compared with those of the forms of growth. L. J. S.

Hettich (A.) *Über die äußere scheinbare Unsymmetrie der Alkalihalogenide.* Zeits. Krist., 1926, vol. 64, pp. 265–295, 11 figs.

The structure of KCl and allied salts as shown by X-ray experiments is holohedral, whereas from the asymmetric etched figures many experimenters have concluded that the crystals are hemihedral. It is found that, if the etching is performed under conditions of perfect cleanliness, the etched figures substantiate the holohedral nature of the crystals. If, however, the substance has been exposed to the air for any length of time, or has been touched by the fingers, the etched figures become asymmetric. A similar result is obtained if a trace of optically active substance is added to the etching reagent, though the figures become symmetric when the concentration of the added substance is increased. H. H.

Friedel (G.). *Sur la controverse récente entre MM. Hettich et Valeton. Les formes hémièdres holoaxes n'impliquent pas nécessairement l'hémiédrie du cristal.* Compt. Rend. Acad. Sci. Paris, 1927, vol. 184, pp. 789–791.

Valeton (Zeits. Physik, 1926, vol. 39, pp. 69–74) objected to Hettich's explanation (preceding Abstract) of the hemihedral etched figures, which he found were produced on KCl by optically active solvents. The author gives reasons for considering that Hettich is right in supposing that holohedral crystals can give hemihedral etched figures when immersed in optically active liquids. H. H.

X-rays and Crystal-structure.

Ježek (Bohuslav). *Geometrický výklad a výpočet lauegramů.* [Geometrical interpretation and calculation of Lauegrams.] Časopis pro Mineralogii a Geologii, 1923, vol. 1, pp. 92–99, 120–128, 9 figs.

Elementary explanations of the calculation of Lauegrams, with formulae and constructions. A mechanical method with a gnomonic logarithmic ruler is proposed. F. S.

Bernal (J. D.). *On the interpretation of X-ray, single crystal, rotation photographs.* Proc. Roy. Soc. London, Ser. A, 1926, vol. 113, pp. 117–160, 4 pls., 22 text-figs.

A mathematical discussion of the results obtained when a crystal is rotated in a beam of homogeneous X-rays (rotation method) or when the crystal is turned backwards and forwards through a small angle about a zone-axis (oscillation method). The size and shape of the unit cell, the indices of the reflecting planes, and the space-group can be deduced. Elaborate charts and tables are given to save tedious calculations. [Cf. Min. Mag., vol. 21, p. 258.] L. J. S.

Schiebold (E.). *Die Drehkristallmethode.* Fortschr. Min. Krist. Petr., 1927, vol. 11, pp. 113–280, 2 pls., 55 text-figs.

An exhaustive account of the X-ray rotating (and oscillating) crystal method, with descriptions of the apparatus used and the mode of interpreting the photographs. A bibliography of 134 items is added. L. J. S.

Alexander (E.) & Herrmann (K.). *Nomogramm zur Auswertung von Drehkristallaufnahmen.* Zeits. Krist., 1927, vol. 65, pp. 110–116, 3 figs.

This is a practical device for saving labour of calculation in reducing observations by the Polanyi-Schiebold rotation method. The nomogram

gives the value of the sine of the angle of reflection $\frac{1}{2}\theta$, when the co-ordinates $2p$, $2e$ of the interference points on the film and the dimensions of the camera are known. The values of $2p$, $2e$, $\sin\frac{1}{2}\theta$ are plotted on three lines in such a way that corresponding values of these quantities are given by three collinear points. H. H.

Bragg (W. L.). *Model gratings to illustrate the diffraction of X-rays by crystals.* Mem. Manchester Lit. Phil. Soc., 1925, vol. 69 (for 1924–25), pp. 35–38, 1 pl.

Gratings of various types of complexity were obtained by photographing a plate (such as used in the half-tone printing process) ruled with 400 lines to an inch, the plate being shifted through a fraction of 1/400 inch between each exposure. The intensities of the different orders of optical spectra given by such gratings are compared with the X-ray spectra given by the (111) planes of halite and diamond. L. J. S.

Boldyrew (A.). *Knieröhre zur Justierung von Aufnahmevorrichtungen vor dem Röntgenstrahl.* Zeits. Krist., 1927, vol. 65, pp. 117–118, 2 figs.

A device for adjustment of the Debye-Scherrer X-ray camera, which avoids risk of injury to the sight. H. H.

Ewald (P. P.) & Hermann (C.). *Gilt der Friedelsche Satz über die Symmetrie der Röntgeninterferenzen?* Zeits. Krist., 1927, vol. 65, pp. 251–260, 4 figs.

Friedel's law states that the effect of a crystalline medium on Röntgen rays is centro-symmetric, so that the reflections from the two faces of a crystal plate are identical. It is shown that the law is only valid for media without absorption, but the departure from accuracy is not appreciable so far as measurements made heretofore are concerned. H. H.

Rinne (Friedrich). *Einige Erfahrungen und Bemerkungen über die thermische Beeinflussung des Laueeffektes, insbesondere beim Steinsalz.* Zeits. Krist., 1926, vol. 64, pp. 455–474, 14 figs.

The earlier experimenters differed as to whether variation of temperature has an appreciable effect on Laue-diagrams. The author devised a piece of apparatus for the taking of such photographs over a wide range of temperature. He found that halite diagrams showed little alteration unless the temperature rose above 700° C. At about that limit the Laue-diagram changed into another type, which is in the main

preserved when the material cools again, though becoming more elaborate. Similar results were obtained with sylvine, &c. H. H.

Frebold (Georg). *Über eine Methode zur Bestimmung undurchsichtiger Mineralien, besonders von Erzen, mit Hilfe der Röntgenstrahlen.* Centralblatt Min., Abt. A, 1926, 278–281.

For the examination of ores, supplementary to the microscopical examination of polished sections, X-ray photographs are taken by the Debye-Scherrer method [cf. Abstr., vol. 2, p. 327]. L. J. S.

Erdal (Aslak). *Beiträge zur Analyse von Mischkristallen und Legierungen.* Zeits. Krist., 1927, vol. 65, pp. 68–82, 5 figs.

L. Vegard enunciated the law that in mixed crystals the edge of the space-lattice is a linear function of the concentration expressed in molecules per cent. The author tests the salts KBr–NH_4Br, and finds that true mixed crystals are formed containing up to 40 % NH_4Br and obeying the law. By extrapolation the value 6·87 Å. is got for NH_4Br as the length of the edge of the elementary cell of the rock-salt type. Alloys of silver and copper were obtained obeying the Vegard law and containing between 0 and 6·5 % or between 93 and 100 % of silver.

H. H.

McLennan (J. C.) & Wilhelm (J. O.). *The crystal structure of solid oxygen.* Phil. Mag., 1927, ser. 7, vol. 3, pp. 383–389, 3 figs.

X-ray examination of solid oxygen at −252° C. shows that this is body-centred orthorhombic with two molecules in the unit cell of dimensions $a = 5{\cdot}50$, $b = 3{\cdot}82$, $c = 3{\cdot}44$ Å.; $a : b : c = 1{\cdot}44 : 1 : 0{\cdot}9$. The calculated density 1·46 is lower than that usually accepted (1·426), suggesting that there are two modifications of solid oxygen. L. J. S.

Hassel (O.) & Mark (H.). *Über die Kristallstruktur des Graphits.* Zeits. Physik, 1924, vol. 25, pp. 317–337, 5 figs.

The hexagonal cell of graphite containing 8 carbon atoms has dimensions $a = 2{\cdot}47$, $b = 4{\cdot}25$, $c = 6{\cdot}79$ Å. L. J. S.

Hassel (O.) & Mark (H.). *Über die Struktur des Wismuts.* Zeits. Physik, 1924, vol. 23, pp. 269–277.

Bismuth examined by the rotating crystal method gives results confirming those of Ogg and James [Abstr., vol. 1, p. 194]. The unit rhombohedron has $\alpha = 87° 34'$, $a = 6{\cdot}57$ Å. Space-group D_{3d}^{5}. L. J. S.

Levi (G. R.). *Struttura cristallina del tallio.* Nuovo Cimento, 1926, n. ser., vol. 3, pp. 297–303.

In a previous paper [Abstr., vol. 2, p. 513] the author showed the structure of metallic thallium to be hexagonal close-packed. Another worker, K. Becker (Zeits. Phys., 1923, vol. 16, p. 169), has stated it to be face-centred tetragonal [see also Abstr., vol. 3, p. 177]. Exchange of films with Becker showed these to be identical, so that only one result is possible. The author has had some dendritic thallium measured by E. Artini, who found 60° to be a preponderating angle in the measurements. This is considered as proving the author's interpretation. H. E. B.

Jung (H.). *Röntgenographische Untersuchungen über Kupfer, Silber und Gold.* Zeits. Krist., 1926, vol. 64, pp. 413–429.

Elements form a 'eutropic series' according to G. Linck, if they lie in the same vertical column of the periodic system, and their crystallographic properties vary with the atomic weight according to some definite law. The author investigated copper, silver, and gold to see whether they form a eutropic series. In their usual modifications he found their lattice constants to be respectively 3·62, 4·070, and 4·068 Å. Gold was tested in other forms, for instance, in ruby glass, but no evidence was found for any other crystalline modification, and the same result was obtained by consideration of mixed crystals of gold and silver. It is possible that an orthorhombic variety of copper, silver, and gold may exist, but, if so, it is too unstable for these experiments. The 'acetate copper' of Schützenberger proved to be only copper in a fine state of division with oxide as an impurity. It was concluded that copper, silver, and gold do not form a eutropic series, and that the same is true for certain other vertical columns of the periodic system. H. H.

Westgren (Arne) & Phragmén (Gösta). *Röntgenanalyse des Chrom-Kohlenstoffsystemes.* Kgl. Svenska Vetenskapsakad. Handl., 1926, vol. 2, no. 5, 11 pp., 5 pls.

The presence of three chromium-carbon compounds is indicated by this research. The one poorest in carbon is cubic with $a = 10{\cdot}638$ Å. and with 24 Cr_4C molecules in the unit (face-centred) cube. A second modification, corresponding to Ruff and Foehr's Cr_5C_2, is hexagonal, with $a = 13{\cdot}98$, $c = 4{\cdot}523$ Å., and $c/a = 0{\cdot}324$. There are eight molecules of Cr_7C_3 in this structure. In the third type, the Cr_3C_2 of Moissan and of Ruff and Foehr, there are four molecules of Cr_3C_2 in a unit ortho-

rhombic cell of dimensions $a = 2{\cdot}821$, $b = 5{\cdot}52$, $c = 11{\cdot}46$ Å., corresponding to $a : b : c = 0{\cdot}246 : 0{\cdot}480 : 1$. H. E. B.

Phragmén (G.). *The constitution of the iron-silicon alloys.* Journ. Iron & Steel Inst., 1926, vol. 114 (no. 2 for 1926), pp. 397–403, 5 pls., 2 text-figs.

Alloys have been prepared from electrolytic iron and silicon (which contained 0·15 % Al) and melted *in vacuo* in porcelain crucibles. X-ray powder photographs indicate the presence of three intermediary phases between the pure extremes. Phases ϵ and ζ correspond to FeSi and $FeSi_2$. Phase ϵ is cubic with 4FeSi in the unit, of symmetry T_4. Phase ζ, $FeSi_2$, is tetragonal with one molecule in the unit cell arranged on space-group C_{4h}. The crystal-structure of the third phase is complicated and has not yet been determined. Photographs of varying proportions of phase α show that the lattice parameters of this solid solution are functions of the composition. The compositions of both FeSi and $FeSi_2$ are not rigid, but vary slightly. H. E. B.

Harang (Leiv). *Über die Kristallstruktur der Heuslerschen Legierungen.* Zeits. Krist., 1927, vol. 65, pp. 261–285, 4 figs.

Heusler found that alloys of manganese and tin have ferro-magnetic properties, the highest degree of magnetization being possessed by two alloys, one of Al-Cu-Mn, and the other of Sn-Cu-Mn. The magnetic properties change markedly with the constitution and previous history of each specimen. The author subjected these two alloys to X-ray examination in order to see how far the magnetic properties were due to their atomic structure. In the Al-Cu-Mn alloy exist two cubic lattices of edges 2·975 and 8·71 Å., the former space-centred and consisting of Mn-Al, and the latter consisting of Al-Cu. The magnetic properties depend on both lattices, and not merely on one of them. The Sn-Mn-Cu alloy proved to possess a far more complicated structure, and has not been fully investigated. H. H.

Brill (Rudolf). *Das Kristallgitter des Lithiumnitrides Li_3N.* Zeits. Krist., 1927, vol. 65, pp. 94–99, 3 figs.

Lithium nitride was analysed by the Debye-Scherrer method, and a Laue diagram was obtained from a rough crystal. The crystal system is probably cubic with the space-group T^4; while the elementary cell has an edge of length 5·50 Å. and contains four molecules of Li_3N. As a possible alternative the cell may contain one molecule of $Li_{12}N_4$,

the space-group being T^1. There is complete analogy between the structures of Li_3N and H_3N. H. H.

Brill (Rudolf). *Röntgenographische Untersuchung des Eisennonacarbonyls* $Fe_2(CO)_9$. Zeits. Krist., 1927, vol. 65, pp. 85–93, 3 figs.

The elementary cell of diferrononacarbonyl $Fe_2(CO)_9$ is orthohexagonal with $a = 11{\cdot}08$, $b = 6{\cdot}45$, $c = 15{\cdot}8$ Å., and contains four molecules. The space-group is one of C_6^6, C_{4v}^4, C_{6h}^2, D_6^6, or D_{6h}^4, but an exact determination is impossible at present. H. H.

Emmons (R. C.), Stockwell (C. H.), & Jones (R. H. B.). *Argentite and acanthite.* Amer. Min., 1926, vol. 11, pp. 326–328, 1 fig.

Schneiderhöhn (H.). *Argentite and acanthite.* Ibid., 1927, vol. 12, pp. 210–211.

(1) X-ray patterns of silver sulphide [? artificial] were taken at room temperature and at 200–250° C., i.e. below and above the inversion-point at about 180° C. At the lower temperature the structure is orthorhombic, while at the higher it is body-centred cubic with $a = 4{\cdot}84$ Å. This supports the conclusion of L. S. Ramsdell [Abstr., vol. 3, p. 19] that acanthite is orthorhombic and that argentite is cubic only above 180°. The latter is, however, not isomorphous with galena (halite type, with $a = 5{\cdot}93$ Å.).

(2) This conclusion was earlier arrived at by H. Schneiderhöhn in 1922 [Abstr., vol. 2, p, 506] by the method of examining polished sections of argentite and acanthite in polarized light. Argentite and chalcosine when showing a lamellar structure (due, as in leucite, to transformation from the high-temperature to the low-temperature modification) must have been formed at temperatures above 180° and 91° C. respectively, these being points on the 'geological thermometer'. Further, such 'lamellar argentite' and 'lamellar chalcosine' must be of primary origin and not deposited by 'secondary enrichment' [Abstr., vol. 1, p. 158]. L. J. S.

Hartwig (W.). *Die Kristallstruktur von Berzelianit.* Fortschr. Min. Krist. Petr., 1927, vol. 11, pp. 307–308.

Berzelianite from Skrikerum, Sweden, which on analysis gave the formula Cu_2Se with some sulphur and silver, has a face-centred cubic structure with the atoms arranged as in the fluorite type; $a = 5{\cdot}731$ Å. with 4 mol. Cu_2Se. Artificially prepared Cu_2Se has the same structure with $a = 5{\cdot}748$ Å. L. J. S.

Barth (Tom.). *Die reguläre Kristallart von Kupferglanz.* Centralblatt Min., Abt. A, 1926, pp. 284–286.

X-ray photographs of the cubic high-temperature modification of Cu_2S [whether heated chalcosine or prepared material not stated; also no mention of temperature] show a structure of the fluorite type, but with the cations and anions in reversed positions; $a = 5{\cdot}59$ Å., calculated density 5·97. L. J. S.

Jong (W. F. de) & Willems (H. W. V.). *Existenz und Struktur der Disulfide NiS_2 und CoS_2.* Zeits. Anorg. Chem., 1927, vol. 160, pp. 185–189.

The disulphides were prepared by adding the monosulphides to fused sulphur. A grey crystalline powder resulted which examined by X-rays showed the pyrite structure; for NiS_2, $a = 5{\cdot}74$ Å., density 4·31; for CoS_2, $a = 5{\cdot}64$, density 4·55. Bravoite from Mechernich [Abstr., vol. 3, p. 154] gave $a = 5{\cdot}57$. It is remarked that these values are appreciably higher than for pyrite [$a = 5{\cdot}38$]. L. J. S.

Menzer (G.). *Über die Kristallstruktur von Linneit, einschließlich Polydymit und Sychnodymit.* Fortschr. Min. Krist. Petr., 1927, vol. 11, pp. 315–316.

X-ray photographs of linnaeite from Müsen gave a face-centred cubic structure with $a = 9{\cdot}398$ Å. and containing eight molecules Co_3S_4 in the unit cell. The close similarity to magnetite suggests the space-group O_h^7 (spinel type). Polydymite ($a = 9{\cdot}405$ Å.) and sychnodymite ($a = 9{\cdot}434$ Å.) have the same structure, with some extra lines referred to admixed chalcopyrite, and they are regarded as essentially identical with linnaeite. L. J. S.

Barth (Tom.) & Lunde (Gulbrand). *Über das Mineral Villiaumit.* Centralblatt Min., Abt. A, 1927, pp. 57–66.

Barth (Tom.). *Das Streuvermögen des Natriumfluorids für Röntgenstrahlen.* Zeits. Physik, 1927, vol. 40, pp. 804–808, 1 fig.

X-ray powder photographs of carmine villiaumite (NaF) from the nepheline-syenites of the Los Islands, West Africa, and of prepared sodium fluoride prove the essential identity of these. The structure is of the halite type with cube edges $a = 4{\cdot}614$ and $4{\cdot}619$ respectively. Villiaumite is, however, birefringent with marked pleochroism: but when it is heated to 300° the colour and birefringence are lost. It is suggested that the pseudo-cubic characters of the mineral are due to radioactivity and strain, a comparison being made with blue halite. Prepared sodium

fluoride exposed to X-rays acquires a pink colour and becomes feebly birefringent and pleochroic. Villiaumite when pinched in the forceps shows a marked increase in its pleochroism. The question of the scattering of X-rays and the intensities of reflections from planes with uneven indices (311) (331) is discussed more fully in the second paper. L. J. S.

Kolderup (Niels-Henr.). *Über die Krystallstruktur von Blei, Bleiglanz, Bleifluorid und Cadmiumfluorid.* Bergens Museums Aarbok, 1925, for 1924–25, Naturvidensk. række, no. 2, 18 pp., 1 pl., 1 text-fig.

Measurements were made by the X-ray powder method. Lead, face-centred cubic, $a = 491$ Å. Galena, cubic (halite type), $a = 5{\cdot}91$ Å. Lead fluoride (prepared from HF and $PbCO_3$) has the form of minute optically-negative hexagonal prisms. When heated at 250° this α-PbF_2 changes to β-PbF_2 (sp. gr. 6·588); the latter is cubic (fluorite type), $a = 5{\cdot}93$ Å. Cadmium fluoride CdF_2 is cubic (fluorite type), $a = 5{\cdot}40$ Å. L. J. S.

Dickinson (Roscoe G.). *Die Symmetrie und der Elementarbereich von Zinntetrajodid.* Zeits. Krist., 1926, vol. 64, pp. 400–404, 1 fig.

In an earlier paper the author [Abstr., vol. 2, p. 201] had found the space-group T^6_h for SnI_4, while other workers such as H. Ott [Abstr., vol. 3, p. 179] or H. Mark and K. Weissenberg [Abstr., vol. 2, p. 200] have given structures making T^4_d or T^1 more probable. Further experiments are made on the faces (210) and (120) in order to throw light on the discrepancy. H. H.

Wyckoff (Ralph W. G.) & McCutcheon (Thomas P.). *The crystal structure of hexamine-cobalti-iodide* $[Co(NH_3)_6]I_3$. Amer. Journ. Sci., 1927, ser. 5, vol. 13, pp. 223–233, 2 figs.

$[Co(NH_3)_6]I_3$ crystals were got by mixing together dilute solutions of $[Co(NH_3)_6](OH)_3$ and HI. They were a millimetre or less in cross-section; they were used to determine the density 2·775–2·780 and to obtain Laue and powder X-ray photographs. The space-group is probably O_i–5, and the elementary cubic cell is of edge 10·88 Å., and contains four molecules. H. H.

Dehlinger (U.). *Über die Raumgruppe von* $(CN_2H_2)_2$ *und die Kristallstruktur von* $CaCN_2$. Zeits. Krist., 1927, vol. 65, pp. 286–290, 3 figs.

Dicyandiamide, $(CN_2H_2)_2$, crystallizes in the monoclinic system with $a : b : c = 1{\cdot}0021 : 1 : 0{\cdot}4863$, $\beta = 89° 25'$. X-ray experiments by the rotation-method give a unit cell of $13{\cdot}8 \times 4{\cdot}4 \times 6{\cdot}2$ Å. containing four

molecules. The space-group, so far as these observations are concerned, may be C_s^3, C_2^3, or C_{2h}^3. Calcium cyanamide, $CaCN_2$, was investigated by the powder method, which gave lines consistent with the supposition that it has the same structure as $CsICl_2$, NaN_3, $NaHF_2$. H. H.

Gibbs (Reginald Edmund). *The variation with temperature of the intensity of reflection of X-rays from quartz and its bearing on the crystal structure.* Proc. Roy. Soc. London, Ser. A, 1925, vol. 107, pp. 561–570, 10 figs.

Gibbs (Reginald E.). *Structure of α quartz.* Ibid., 1926, vol. 110, pp. 443–455, 14 figs.

Gibbs (R. E.). *The polymorphism of silicon dioxide and the structure of tridymite.* Ibid., 1926, vol. 113, pp. 351–368, 18 figs.

(1) Graphs showing the variation of the intensity of reflection with the temperature, from 0° to 800° C., are given for various planes; they show a marked break at the transition temperature (575° C.). The distance d between the basal (111) planes of silicon atoms and of oxygen atoms is calculated for various temperatures.

(2) From the structure determined for hexagonal β-quartz [Abstr., vol. 3, p. 21] an attempt is made to deduce as a distortion that of the low-temperature α-quartz, but all the parameters fixing the positions of the atoms cannot be evaluated. The oxygen atoms lie in basal planes at $c/9$ above and below the planes of silicon atoms. The silicon atoms have been shifted 0·3 Å. from their β-positions, and the surrounding tetrahedron of oxygen atoms have been turned through about 9° and slightly distorted. A possible distinction between the causes of the pyro- and piezo-electricity of α-quartz is discussed.

(3) The building-unit of a tetrahedron of oxygen atoms surrounding a silicon atom found in hexagonal β-quartz and in cubic β-cristobalite also holds in tridymite. The structures are ionic, rather than molecular. β-tridymite is hexagonal with a structure similar to that of ice, the space-group being D_{6h}^4 with four molecules in the cell $a = 5{\cdot}03$, $c = 8{\cdot}02$ Å. α-tridymite is orthorhombic with $a = 9{\cdot}9$. $b = 17{\cdot}1$, $c = 16{\cdot}3$ Å. with between two and eight SiO_2 groups. X-ray photographs taken at different temperatures confirm the existence of a third form, α′-tridymite, near α-tridymite. L. J. S.

Böhm (J.). *Röntgenographische Untersuchung des Chalkotrichit.* Zeits. Krist., 1926, vol. 64, p. 550.

A rotation photograph of a needle of chalcotrichite (Cu_2O) about the axis of the needle gave a diagram identical with that obtained by

rotating an octahedron of cuprite about the axis [100]. The lattice constant is $d = 4{\cdot}293$ Å. L. J. S.

Barth (Tom.). *Über die Gitterdimensionen des Zinkoxyds und das Achsenverhältnis des Zinkits.* Norsk Geol. Tidsskrift, 1927, vol. 9, pp. 317–319.

New determinations for pure ZnO by the powder method (the material being mixed with halite for direct comparison) gave $a = 3{\cdot}242$, $c = 5{\cdot}176$ Å., $c/a = 1{\cdot}596$. This axial ratio differs slightly from that for natural zincite, no doubt because the latter contains some manganese and iron. L. J. S.

Aminoff (G.). *Über die Kristallstruktur von Hausmannit ($MnMn_2O_4$).* Zeits. Krist., 1926, vol. 64, pp. 475–490.

The structure of hausmannite ($MnMn_2O_4$) was investigated by means of powder and rotation photographs. It proves to be exactly analagous to that of magnetite, but with $c : a = 1{\cdot}16$ instead of 1. The elementary cell is face-centred and contains eight molecules, with $a = 8{\cdot}14$ and $c = 9{\cdot}42$ Å. The space-group is D_{4h}^{19}. H. H.

Brentano (J.) & Dawson (W. E.). *Determination of the lattice spacing and of the rhombohedral angle of magnesium carbonate from a microcrystalline powder.* Phil. Mag., 1927, ser. 7, vol. 3, pp. 411–418, 1 fig.

X-ray examination of compact magnesite from 'Senese' [i.e. of Siena] gave the rhombohedral angle $\alpha = 103° 19'$ and the edge of the cleavage rhombohedron $a = 5{\cdot}899$ Å., containing four molecules $MgCO_3$. The spacing d_{100} is 5·477 Å., and the calculated density 3·000. L. J. S.

Bragg (W. Lawrence) & West (J.). *The structure of certain silicates.* Proc. Roy. Soc. London, Ser. A, 1927, vol. 114, pp. 450–473, 8 figs.

In 1920 W. L. Bragg gave the atomic diameter of oxygen as 1·30 Å., the lowest of all the elements [cf. Abstr., vol. 2, p. 244]. Now, following J. A. Wasastjerna (1923), it is made the largest. The following ionic diameters are given: O^{--}, OH^-, and F^- 2·7; Si^{++++} and Be^{++} 0·6; Al^{+++} 1·1; Mg^{++} and Fe^{++} 1·5; Na^+ and Ca^{++} 2·0; K^+ 2·6 Å. [cf. Abstr., vol. 3, p. 327]. It is supposed that the large oxygen ions form the framework structure of the silicates, and that the silicon and metal ions fit into the interspaces. In kyanite [Abstr., vol. 3, p. 250] it is shown that the oxygen atoms conform to the cubic type of closest packing, whilst in the olivine and chondrodite groups they are in the hexagonal

type of closest packing (as in BeO, Al_2O_3, and chrysoberyl). In beryl and phenakite the structure of oxygen atoms is more open.

	a.	*b.*	*c.*
Monticellite, $MgCaSiO_4$	4·815	11·08	6·37 Å.
Olivine, $(Mg,Fe)_2SiO_4$	4·755	10·21	$5·98 = 2 \times 2·99$
Chondrodite, $Mg_3[Mg(F,OH)]_2[SiO_4]_2$ ...	4·733	10·27	$14·88 = 5 \times 2·976$
Humite, $Mg_5[Mg(F,OH)]_2[SiO_4]_3$	4·738	10·23	$20·86 = 7 \times 2·980$
Clinohumite, $Mg_7[Mg(F,OH)]_2[SiO_4]_4$ ...	4·75	10·26	$26·86 = 9 \times 2·984$

This brings out the morphotropic relationship of the group (for chondrodite the *a*- and *b*- axes have been interchanged and $\beta = 70° 58'$; for clinohumite the *c*-axis is uncertain). L. J. S.

Bragg (W. Lawrence) & West (J.). *The structure of beryl, $Be_3Al_2Si_6O_{18}$* Proc. Roy. Soc. London, Ser. A, 1926, vol. 111, pp. 691–714, 7 figs.

X-ray spectrometer measurements on beryl gave for the unit cell containing two molecules $Be_3Al_2Si_6O_{18}$ the dimensions $a = 9·21$, $c = 9·17$ Å., corresponding with $a : c = 1 : 0·9956$ (the *c*-axis being twice that usually adopted crystallographically). The space-group is D_{6h}^2. The grouping of the atoms and distribution of the electrons are discussed in detail in connexion with the measurements of the absolute intensities of X-ray reflection. Each silicon atom is surrounded tetrahedrally by four oxygen atoms, each aluminium atom octahedrally by six oxygen atoms, and each beryllium atom by four oxygen atoms on a distorted tetrahedron. Rings of Si_6O_{18} are stacked up along the hexagonal axis at the centre of each cell and are linked by having two of the oxygen atoms in each SiO_4 group common with SiO_4 groups above and below (thus giving the metasilicate ratio). No atomic centre is nearer than 2·55 Å. to a hexagonal axis, along which is a channel, with the result that the whole structure is honey-combed. [No mention is made of the density and kind of material employed for the determinations.] L. J. S.

Bragg (W. Lawrence). *The structure of phenacite, Be_2SiO_4.* Proc. Roy. Soc. London, Ser. A, 1927, vol. 113, pp. 642–657.

X-ray measurements on phenakite show a rhombohedral cell of edge $a = 7·684$ Å. and axial angle $\alpha = 108° 1'$ with six molecules of Be_2SiO_4. The space-group is C_{3i}^2. The hexagonal dimensions are $a = 7·178$, $c = 8·226$ Å. [Here *c* is the length between the trigonal apices of the rhombohedron, and *a* the perpendicular distance from a side corner to the trigonal axis.] Details are given of the method of arriving at the grouping of the atoms. Silicon atoms lie at the centre of tetrahedral

groups of oxygen atoms, and similar positions are probably occupied by beryllium atoms. L. J. S.

Goßner (B.). *Röntgenographische Untersuchung von Silikaten.* Centralblatt Min., Abt. A, 1927, pp. 39–44.

Water-clear crystals of phenakite from Minas Geraes examined by the rotating crystal X-ray method gave for the elementary cell a rhombohedron of edge $a = 7{\cdot}68$ Å. and axial angle $\alpha = 108° 1'$ containing six molecules Be_2SiO_4. The space-group is C_{3i}^2. Hexagonal dimensions are $a = 12{\cdot}42$ and $c = 8{\cdot}21$ Å. for a cell containing eighteen molecules. Dioptase crystals from Guchab, South-West Africa, give a similar structure with $a = 8{\cdot}77$ Å., $\alpha = 111° 42'$, containing six molecules H_2CuSiO_4.

L. J. S.

Goßner (B.). *Über die Symmetrie von Nephelin.* Centralblatt Min., Abt. A, 1927, pp. 150–158.

Rotating crystal photographs of nepheline (a water-clear crystal from Vesuvius) gave $a = 10{\cdot}05$, $c = 8{\cdot}43$ Å., with 4 mol. $Na_2Al_2Si_2O_8$ in the rhomb-based cell. Etch-figures suggest for nepheline the hexagonal-pyramidal class, whilst the other physical characters suggest the dihexagonal-bipyramidal class. The X-ray data point to the latter with the space-group C_{6h}^2. L. J. S.

Gottfried (C.). *Über die Struktur des Nephelins.* Zeits. Krist., 1927, vol. 65, pp. 100–109.

By the rotation method the space-group of nepheline was found to be C_6^6; while the orthohexagonal elementary cell contains sixteen molecules of $NaAlSiO_4$ and has edges $a = 10{\cdot}09$ and $c = 8{\cdot}49$ Å. H. H.

Barth (Tom.). *Die kristallographische Beziehung zwischen Helvin und Sodalit.* Norsk Geol. Tidsskrift, 1926, vol. 9, pp. 40–42, 1 fig.

X-ray powder photographs of helvine and sodalite are very similar and give for the cube edge $a = 8{\cdot}19$ and $8{\cdot}85$ Å. respectively, the unit cell containing two molecules. Helvine has the space-group T_d^1 and the chemical formula is written $Mn_8Be_6Si_6O_{24}S_2$. L. J. S.

Dickson (E. C. S.) & Binks (W.). *The crystalline structure of anhydrite.* Phil. Mag., 1926, ser. 7, vol. 2, pp. 114–128, 4 figs.

X-ray examination of natural crystals of anhydrite by the spectrometer and powder methods gave results agreeing with those of F. Rinne and others [Abstr., vol. 2, p. 509] and their values are adopted. Assuming a regular tetrahedral arrangement for the SO_4-group the positions of the atoms are determined. L. J. S.

Wasastjerna (Jarl A.). *The crystalline structure of anhydrite.* Phil. Mag., 1926, ser. 7, vol. 2, pp. 992–994.

The author had previously (1925) determined the structure of anhydrite, giving parameters for the positions of the atoms differing somewhat from those of Dickson and Binks [preceding abstract]. L. J. S.

James (R. W.) & Wood (W. A.). *The crystal structure of barytes, celestine and anglesite.* Proc. Roy. Soc. London, Ser. A, 1925, vol. 109, pp. 598–620, 4 figs.

The results for baryte given in the preliminary paper [Abstr., vol. 2, p. 509] are now slightly modified: $a = 8{\cdot}85$, $b = 5{\cdot}43$, $c = 7{\cdot}13$ Å.; the co-ordinates of the four sulphur atoms in the cell are $(-\frac{1}{16}-x' \cdot \frac{1}{4} \cdot -\frac{1}{3}-z'), (\frac{1}{16}+x' \cdot -\frac{1}{4} \cdot \frac{1}{3}+z'), (-\frac{7}{16}+x' \cdot \frac{1}{4} \cdot \frac{1}{6}-z'), (\frac{7}{16}-x' \cdot \frac{1}{4} \cdot -\frac{1}{6}+z')$ [Ba atoms as before]; and the parameters $x = x' = z = 0{\cdot}0055$, $z' = -0{\cdot}028$. Celestine and anglesite have the same structure but with different parameters. For celestine, $a = 8{\cdot}36$, $b = 5{\cdot}36$, $c = 6{\cdot}84$ Å.; and for anglesite, $a = 8{\cdot}45$, $b = 5{\cdot}38$, $c = 6{\cdot}93$ Å. The similarity in structure in other compounds XRO_4 is discussed, and the following values are given: for $KClO_4$, $a = 8{\cdot}84$, $b = 5{\cdot}68$, $c = 7{\cdot}22$; for $KMnO_4$, $a = 9{\cdot}08$, $b = 5{\cdot}70$, $c = 7{\cdot}40$. L. J. S.

Westenbrink (H. G. K.). *The space-groups of the rhombic and monoclinic heptahydrates of the sulphates of the bivalent metals.* Proc. Sect. Sci. K. Akad. Wetensch. Amsterdam, 1926, vol. 29, pp. 1223–1232, 2 figs. (Translated from Verslag, vol. 35.)

The first four salts listed below are orthorhombic-bisphenoidal with space-group V_4, and the unit cell contains four molecules. The ferrous and cobalt salts are monoclinic-holohedral, C_{2h}^5, with sixteen molecules.

	a.	*b.*	*c.*
$MgSO_4.7H_2O$	11·89	12·01	6·86 Å.
$MgCrO_4.7H_2O$	11·89	12·01	6·89
$NiSO_4.7H_2O$	11·86	12·08	6·81
$ZnSO_4.7H_2O$	11·85	12·09	6·83
$FeSO_4.7H_2O$	15·34	12·98	20·02
$CoSO_4.7H_2O$	15·45	13·08	20·04

L. J. S.

Vegard (L.). *Results of crystal analysis.* Phil. Mag., 1926, ser. 7, vol. 1, pp. 1151–1193, 14 figs.

Rutile, anatase, cassiterite, and zircon previously examined by the author by the X-ray spectrometer method [Abstr., vol. 2, p. 506] have

now been examined by the powder method. Rutile ($a = 9{\cdot}30, c = 5{\cdot}98$ Å. $c/a = 0{\cdot}643$) and cassiterite ($a = 9{\cdot}45$, $c = 6{\cdot}36$ Å., $c/a = 0{\cdot}673$) have the space-group D_{4h}^{14}, and are therefore not strictly isomorphous with zircon ($a = 9{\cdot}41$, $c = 6{\cdot}01$ Å., $c/a = 0{\cdot}639$; 8 mols. Zr_2SiO_4) with the space-group D_{4h}^{19}. For anatase $a = 5{\cdot}37$, $c = 9{\cdot}54$ Å., $c/a = 1{\cdot}777$, with 8 mols. TiO_2. The ionic radii are: in rutile, O 1·31, Ti 0·69; cassiterite, O 1·30, Sn 0·75; zircon, O 1·18, Zr 0·99, Si 0·49; anatase, O 1·32, Ti 0·63 Å. Scheelite has the lattice dimensions $a = 7{\cdot}44$, $c = 11{\cdot}35$ Å., $c/a = 1{\cdot}537$, with 8 mol. $CaWO_4$ and the space-group C_{4h}^6; the ionic radii are O 1·125, Ca 1·11, W 1·04 Å. Powellite, $CaMoO_4$, has the same space-group with dimensions $a = 7{\cdot}40$, $c = 11{\cdot}44$ Å., $c/a = 1{\cdot}546$, and ionic radii O 1·12, Ca 1·12, Mo 1·03 Å. L. J. S.

Barth (Tom.). *The structure of synthetic, metamict, and recrystallized fergusonite.* Norsk Geol. Tidsskrift, 1926, vol. 9, pp. 23–26, 3 figs.

Fergusonite is usually 'metamict', being optically isotropic and showing no X-ray interferences. When heated to the glow at about 400° C. it becomes cryptocrystalline and then shows hazy lines in the X-ray powder photograph. After fusion in the oxygen-acetylene blowpipe it shows sharp lines corresponding with a unit tetragonal cell (lattice Γ_t) $a = 4{\cdot}74$, $c = 11{\cdot}31$ Å., $c/a = 1{\cdot}46$, containing eight molecules. Artificial fergusonite was prepared by fusing together Y_2O_3 and Nb_2O_5 to give $YNbO_4$, the cell of which has nearly the same dimensions, $a = 7{\cdot}76$, $c = 11{\cdot}32$ Å., $c/a = 1{\cdot}46$. Yttrium tantalate ($YTaO_4$) has $a = 7{\cdot}75$, $c = 11{\cdot}41$ Å., $c/a = 1{\cdot}47$. Scheelite belongs to the same crystal-class as fergusonite but has a different lattice Γ'_t and space-group C_{4h}^6; the unit cell containing four molecules $CaWO_4$ has dimensions $a = 5{\cdot}26$, $c = 11{\cdot}41$ Å., $c/a = 2{\cdot}17$ (this being at 45° to the usual crystallographic position). L. J. S.

Barth (Tom.). *The structure of risørite.* Norsk Geol. Tidsskrift, 1926, vol. 9, pp. 37–39.

Risørite from Risør, Norway, is optically isotropic, but when fused it is tetragonal with a structure almost identical with that of fergusonite (preceding abstract). The unit cell containing eight molecules has dimensions $a = 7{\cdot}78$, $c = 11{\cdot}41$ Å., $c/a = 1{\cdot}467$. The larger volume of the unit cell and the lower specific gravity correspond with the partial replacement of yttrium, &c., niobate by orthotitanate. L. J. S.

Westenbrink (H. G. K.) & Melle (F. A. van). *Über die Kristallstruktur des Penta-erythrits.* Zeits. Krist., 1926, vol. 64, pp. 548–550, 2 figs.

Laue photographs of penta-erythrite, $C(CH_2OH)_4$, show a tetragonal (not ditetragonal) axis [Abstr., vol. 1, p. 190]. The crystal-class is tetragonal pyramidal and the space-group C_4^5. L. J. S.

Topographical Mineralogy.

Osann (Alfred) [1859–1923]. *Die Mineralien Badens.* Herausgegeben von Gertraud Heffter (verw. Osann). Stuttgart (E. Schweizerbart), 1927, viii + 239 pp., 7 pls., 1 map, 2 text figs. Price 17 Mk.

This is a much larger book than the third edition of G. Leonhard's 'Die Mineralien Badens' (1876). The manuscript was almost finished by the author and has been completed by his widow. The introductory portion (pp. 1–26) gives an account of the rocks in which the minerals occur, and the remainder is devoted to a systematic description of 237 mineral-species found in Baden. Species known only from Baden include schapbachite, wolfachite, heubachite, epigenite, polyargyrite, and hügelite. The principal occurrences are in the volcanic rocks of the Kaiserstuhl and in the mineral-veins in gneiss of the Kinzig and Münster valleys [Abstr., vol. 2, p. 431]. A sketch-map shows the mineral-veins of the Kinzig valley. There is a bibliography of 492 items and an index of localities, but no explanation of the plates. L. J. S.

Ulrich (František). *Příspěvky k topografické mineralogii Čech I.—Beiträge zur topographischen Mineralogie von Böhmen, I.* Věstník Státního Geol. Ústavu Československé Republiky, 1926, vol. 2, pp. 292–305, 2 figs.

I, Hůry, near České Budějovice.—From the abandoned Elias mine galena, blende, pyrite, marcasite, chalcopyrite, silver, dolomite, and crystallized quartz have previously been recorded ; the author now adds the following: cerussite of unusual habit with *c m b* predominating and small *a r x k i z y p o τ* [Dana's letters] ; wulfenite as tabular crystals *c e n* ; pyromorphite as green needles *m c* ; fuchsite in sericitized and silicified vein-breccia. II, neighbourhood of Skuteč, eastern Bohemia.—Sulphide minerals are disseminated in small quartz veins in granodiorite, viz.: molybdenite, pyrrhotine, and mispickel, the last with the forms *c m e q k ξ r ρ u φ n* and twinned on (110). In pegmatite or tin-like veins they are accompanied by fluorite, black tourmaline, pennine, calcite, and traces of scheelite (or powellite?). At one place, near Vrbatův

Kostelec, crystals of sphene have been found in pegmatite. In biotite-pegmatites penetrating gabbro-diorite at Budislava later minerals include nickeliferous pyrrhotine, chalcopyrite, and pyrite, also fluorite, crystals of smoky and ferruginous quartz, black tourmaline, spessartine, orthite, beryl, and rarely zircon. In the gabbro-diorite large crystals of hornblende are often altered to biotite, and during the later hydrothermal stage the biotite was altered to pennine. F. S.

Konečný (B.) & Rosický (V.). *O některých skapolithech moravských.* [On some Moravian scapolites.] Publications de la Faculté des Sciences de l'Université Masaryk, Brno, 1926, no. 77, 23 pp. (5 pp. French résumé), 10 figs.

The following analyses by B. Konečný and optical determinations by V. Rosický are given of scapolites from various localities in Moravia.

	Locality.	Sp. gr.	ω_{Na}.	ϵ_{Na}.
I.	Žďár Mt., near Ruda	2·612	1·5653	1·5454
II.	Vícenice, Moravské Budějovice ...	2·662	1·5707	1·5480
III.	Studnice, Nové Město	2·676	1·5808	1·5512
IV.	Moštiště, Velké Meziříčí	2·658	1·5691	1·5457
V.	Nový mlýn, Blažkov	2·692	1·5878	1·5493
VI.	Strážek	2·633	1·5666	1·5450

	SiO_2.	Al_2O_3.	Fe_2O_3.	MgO.	CaO.	Na_2O.	K_2O.	Cl.	CO_2.	H_2O	Total.
I.	52·42	25·05	0·58	0·37	9·10	7·07	2·52	1·30	1·66	0·67	100·74
II.	48·86	27·90	0·66	0·41	14·18	4·70	0·54	1·51	2·66	0·18	101·60
III.	46·94	28·05	0·65	0·20	16·77	4·34	0·38	0·46	3·49	0·27	101·55

Formulae: I, 9MaCl+9MaK+1MeK+10MeO; II, 6MaCl+8MeK+1MeO; III, 10MaCl+16MaK+48MeK+15MeO.

Crystals from Nový mlýn (V) showed the forms (010), (110 , (210), (310), (011), (111), (331). The above results are plotted on diagrams and compared with previously published values. It is shown that the physical properties of the scapolites depend mainly on the relation between the carbonate-bearing molecules (MaK and MeK) and the sum of chloride-marialite (MaCl) and oxide-meionite (MeO). F. S.

Kratochvíl (Josef). *Několik příspěvků topograficko-mineralogických.* [Some contributions to topographical mineralogy.] Věstník Státního Geol. Ústavu Československé Republiky, 1926, vol. 2, pp. 241–244.

At Hejdov, near Čáslav in eastern Bohemia, crystals of datolite, together with sphene, rutile, and chalcopyrite, have been found on prehnite in cavities in amphibolite. At the almandine locality of Zbyslav in the same district rims bordering the large almandines consist of felspars,

quartz, and tourmaline, sometimes with kyanite and green apatite. Other new mineral localities in the neighbourhood of Čáslav are: Mladotice (ilmenite in pegmatite), Moravany (bytownite in gabbro), Kaňk (kyanite in gneiss). A new addition to the list of sulphide minerals from the Carboniferous formation of Kladno is that of mispickel, found in pelosiderite in the Max mine at Libušín. Crystalline limestone from Chýnov in southern Bohemia is spotted with chalcopyrite, pyrite, and galena. F. S.

Novotná (Božena). *Příspěvek ku poznání moravských zeolithů.* [Contribution to the knowledge of Moravian zeolites.] Časopis Moravského Zemského Musea, Brno, 1926, vol. 24, pp. 133–144, 2 pls., 1 text-fig.

I. In the amphibolite of Červená hora [= Mtn.] near Kouty, the succession of zeolites conforms with F. Cornu's rule of decreasing water-content, namely: scolecite, heulandite, stilbite, chabazite, laumontite (leonhardite). For the scolecite were determined: sp. gr. 2·198, mean n 1·515, extinction on (010) 17°; other specimens gave sp. gr. 2·228, mean n 1·5126, extinction often straight. Heulandite crystals show the forms (010), (201), (2̄01), (021), (110) [Des Cloizeaux's orientation]; sp. gr. 2·218, n 1·497. Stilbite, simple crystals and twins, (010), (001), (110), (101), similar to the crystals described by O. B. Bøggild from Umanak, Greenland; sp. gr. 2·116, a 1·495, γ 1·500. Chabazite, (10$\bar{1}$1) only, sp. gr. 2·133, n 1·485–1·488. Leonhardite, sp. gr. 2·285, a 1·506, β 1·512, γ 1·517, extinction-angle to c 36–44°; H_2O at 110° 3·629 %, at 210° 5·00 %, total H_2O 12·97 %. II. The minerals previously described as 'thomsonite' from Červená hora, Štětinov, and Rudoltice are stilbite; and the 'thomsonite' from the iron-ores (limonite) of Květín is evansite (sp. gr. 1·929, n 1·485). F. S.

Kučera (Bruno). *Doplňky k seznamu nerostů a nalezišť moravských za rok 1924 a 1925.* [Additions to the list of Moravian minerals and localities for the years 1924 and 1925.] Časopis Moravského Zemského Musea, Brno, 1926, vol. 24, pp. 184–196. [Cf. Abstr., vol. 1, p. 292; vol. 2, p. 117.]

The following new occurrences in Moravia are noted. Andesine crystals from Pernštejn. Stalactites of halite in the coal-mines of Moravská Ostrava. Alunogen in the coal-mines of Oslavany and at the graphite locality of Tresné. Orthite in granite from Střelice near Brno. Picotite from Jedov near Náměšť. The following corrections are given of earlier determinations. The 'allophane' from Kosov near Jihlava is opal.

'Aluminite' from Petříkov is allophane. Further data are taken from the papers of V. Rosický and B. Novotná [preceding abstracts]. F. S.

Himmelbauer (Alfred). *Beiträge zur Mineralogie Niederösterreichs.* Tschermaks Min. Petr. Mitt., 1927, vol. 37 (for 1926), pp. 207–210.

Minerals from the graphite deposit in marble and mica-schist at Röhrenbach, in Lower Austria, include pyrite, rutile, and kyanite. A rough face near (231) is noted for kyanite; and as there are errors in Goldschmidt's table, a new table of co-ordinate angles is given for kyanite. Minerals from the magnesite quarry at Eichberg on the Semmerling pass: minute crystals of sulphur in altered pyrite crystals; secondary aragonite in altered dolomite. White rosettes on carbonaceous shale from Starzing are perhaps some organic salt of calcium.

L. J. S.

Pelloux (Alberto). *Res ligusticae LV. Sferocobaltite ed altri minerali della valle del Neva (Liguria occidentale).* Ann. Museo Civico Storia Nat. Genova, 1927, vol. 52, pp. 269–281, 3 figs.

A network of small quartz-calcite veins in limestone yielded dolomite, chalybite, sphaerocobaltite, heterogenite?, chessylite, malachite, aurichalcite, chalcopyrite, &c. The sphaerocobaltite has the form of small spherules with radiating fibrous structure or minute crystals of prismatic or rhombohedral habit with the forms *c m r M e f ω s d* [Dana's letters for chalybite] and angles near those of chalybite. L. J. S.

Smythe (J. A.). *Minerals of the north country. Sulphides.* The Vasculum, Newcastle-upon-Tyne, 1924, vol. 11, pp. 7–14. *Sulphates of calcium, sodium and magnesium.* Ibid., 1925, vol. 11, pp. 110–113. *Calcium carbonate.* 1926, vol. 12, pp. 140–147. *Oxides of iron and manganese.* 1926, vol. 13, pp. 20–27. *Minerals of organic origin—hydrocarbons.* 1927, vol. 13, pp. 41–48. *Minerals of organic origin—dopplerite.* 1927, vol. 13, pp. 91–95.

A continuation of previous papers [Abstr., vol. 3, p. 24] on the minerals of the north of England. L. J. S.

Pfalz (Richard). *Die nutzbaren Lagerstätten Südost-Bulgariens.* Zeits. Prakt. Geol., 1927, vol. 35, pp. 49–55, 1 fig. (map).

The following ore-deposits in the south-east of Bulgaria are briefly described. Copper-ores as veins in andesite or andesite-tuff in three districts, and as contact-deposits with granite and diorite in two districts. Iron-ores as veins in andesite and diabase and in contact with granite and diorite; magnetite-sands were formerly worked. Lead- and silver-ores, manganese-ore, graphite, and lignite are also mentioned. L. J. S.

Buttgenbach (H.). *Description de minéraux provenant de nouveaux gîtes congolais.* Mém. Soc. R. Sci. Liége, 1927, ser. 3, vol. 14, no. —, 32 pp., 1 pl., 7 text-figs.

Some account is given of various minerals from recently discovered veins of copper-ore in limestone near intrusive rocks at several places along the tributaries of the Lubi river (6° S., 23° E.) in Belgian Congo. They include chalcosine, covelline, stromeyerite, willemite, dioptase, katangite, plancheite, shattuckite, hydrogiobertite, cerussite, baryte, libethenite, pseudomalachite, volborthite, &c. The willemite forms aggregates of small white to brown crystals in cavities in limestone, with the forms *a e c* and $u(2\bar{1}\bar{1}3)$; $a:c = 1:0{\cdot}6470$ (from $ce = 20° 29'$). Galena and smithsonite are also mentioned from the Luiembe river, farther to the east. L. J. S.

Gillson (Joseph L.). *Optical notes on some minerals from the Mahopac iron mine, Brewster, New York.* Amer. Min., 1926, vol. 11, pp. 281–286.

This abandoned mine is near the well-known Tilly Foster iron-mine in Putnam Co. Minerals recently collected on the old dumps are similar to those from the Tilly Foster mine. Optical data are given for chondrodite, olivine, spinel, chlorite, pyroxene, amphibole, scapolite, tourmaline, and apatite. L. J. S.

Miscellaneous.

Gillson (Joseph L.). *Conichalcite from the Bristol mine, Lincoln County, Nevada.* Amer. Min., 1926, vol. 11, pp. 109–114.

A finely fibrous green mineral encrusting oxidized copper-lead ore is identified by E. V. Shannon's analysis as conichalcite. Deducting 10·60 % impurities ('copper-pitch') the recalculated results, As_2O_5 43·6, CuO 30·0, CaO 21·4, H_2O 5·0, give the formula $2CuO \cdot 2CaO \cdot As_2O_5 \cdot 1\frac{1}{2}H_2O$, representing a double salt. The fibres give straight extinction with positive elongation, α 1·730, γ 1·770 (lower than the values for conichalcite from other localities). On one specimen crystals of apparently the same mineral are optically negative (not positive). L. J. S.

Foshag (William F.). *The identity of newtonite with alunite.* Amer. Min., 1926, vol. 11, pp. 33–35.

'Newtonite' (of R. N. Brackett and J. F. Williams, 1891) occurs as white nodules embedded in clay at Sneeds Creek, Newton Co., Arkansas.

It consists of an aggregate of minute rhombs, and was described as a hydrated aluminium silicate ($Al_2O_3 . 2SiO_2 . 5H_2O$). A new analysis made on material collected at the original locality gave SO_3 34·92, SiO_2 0·96, Al_2O_3 38·56, CaO 0·78, MgO 0·30, K_2O 8·23, Na_2O 0·80, H_2O 15·15 = 99·70, agreeing with alunite, as also do the optical characters of the rhombs. It is suggested that the original analysis was made on a clay, and not on the material examined microscopically. L. J. S.

Ross (Clarence S.) & Shannon (Earl V.). *Nickeliferous vermiculite and serpentine from Webster, North Carolina.* Amer. Min., 1926, vol. 11, pp. 90–93.

A nickeliferous vermiculite occurs as lenticular veins in altered dunite. It is an alteration-product of actinolite, and is associated with chalcedony, kämmererite, colourless chlorite, serpentine, and deweylite. The piles of plates are 5–30 mm. long and 1–10 mm. diameter, and they swell up when heated. It is optically biaxial 2V 0°–8° and negative; α 1·542, $\beta = \gamma$ 1·573. Pleochroism, α pale green, β and γ pale yellowish- to brownish-green. Analysis I on a small quantity of selected pearly yellowish-green scales, and II a more accurate analysis on bright apple-green scales separated by washing; the latter gives the formula $4(Mg,Ni)O . Al_2O_3 . 4SiO_2 . 6\frac{1}{2}H_2O$. The associated nickeliferous serpentine has the form of cream-coloured to greenish-white rounded pellets with n 1·558; analysis III.

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	NiO.	MgO.	CaO.	H_2O (+120°).	(H_2O (−120°).	Total.
I.	35·70	12·00	3·40	—	5·34	25·90	0·32	12·00	7·00	101·66
II.	34·76	14·86	2·74	0·41	11·25	18·18	0·40	12·60	5·20	100·45
III.	39·36	2·76	2·77	—	2·57	36·71	1·32	13·85	1·54	100·88

L. J. S.

Orlov (Alexander). *O železem chudých členech skupiny zoisit-epidotové.* [On members poor in iron of the zoisite-epidote group.] Věstník Královské České Společnosti Nauk (Mém. Soc. Roy. Sci. Bohême), 1926, no. 19, 42 pp., 6 figs. With French résumé.

The following analyses and optical data are given of clinozoisite from: I, Proseč [Abstr., vol. 3, p. 49]; II and III, cavities in amphibolite from Horky near Čáslav.

	SiO_2.	TiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	MgO.	CaO.	Na_2O.
I.	38·01	trace	31·22	2·80	0·96	0·07	0·10	24·42	0·03
II.	38·27	trace	31·69	3·01	0·79	0·07	0·14	24·19	—
III.	38·66	trace	31·94	2·58	0·61	0·06	0·10	24·39	—

	K_2O.	F.	H_2O (+105°).	H_2O (−105°).	Total.	α.	β.	γ.
I.	trace	0·02	1·69	0·05	99·97	>1·710	1·711—1·713	≤1·716
II.	—	—	1·65	0·09	99·90	>1·707	1·709—1·711	<1·712
III.	—	0·03	1·72	0·03	100·19	>1·706	1·708—1·710	<1·712

Sp. gr. of dull-grey portions of crystals 3·343–3·348, of pink 3·353–3·360, and of light wine-yellow or light-greenish 3·351–3·366. The materials analysed are intricate mixtures of optically different varieties, but these are chemically identical. The complex structure is best seen in sections (010) between crossed nicols. The multi-coloured mosaic usually shows boundaries parallel to (001) and (100), but sometimes these are quite irregular. The optic axial plane is always (010), the birefringence is always positive, and the dispersion strong and variable. With increasing birefringence there is a decrease in the extinction-angle $c:a$.

λ.		$\gamma-\alpha$.		$\gamma-\alpha$.		$\gamma-\alpha$.
630 $\mu\mu$	...	0·0012	...	0·0028	...	0·0042
510	...	0·0018	...	0·0040	...	0·0058
460	...	0·0028	...	0·0051	...	0·0073
565	...	$c:a = 35°$	...	$c:a = 9°$	...	$c:a = 6°$

The optic axial angle ($v>\rho$) decreases with increasing $c:a$, ranging from $2V = 83°$ with $c:a = 3°$ ($\lambda = 630\ \mu\mu$) to $2V = 0°$ with $c:a = 35°$. When $c:a>35°$, the optic axial angle ($\rho>v$) again increases, becoming $2V = 58°$ with $c:a = 85°$. These Bohemian clinozoisites (clinozoisite-β) are distinguished from clinozoisite-α [Abstr., vol. 2, p. 187] by the low refraction and small optic axial angle. P. Termier's zoisite-β is probably identical with clinozoisite-β. In the epidote group there is a progressive change in the optical characters as the ellipsoid rotates about the $b = \beta$ axis from $c:a = -5°$ in epidote to $+85°$ in clinozoisite; but the change is not entirely dependent on the chemical composition, and may be due to metastable modifications. F. S.

Šplíchal (Jaroslav). *Hercynit z Hazlavy u Ronšperka.—Hercynite de Hazlava près Ronšperk.* Věstník Státního Geol. Ústavu Československé Republiky, 1925, vol. 1, p. 94.

Analysis of the original hercynite, sp. gr. 4·01, described by F. X. M. Zippe in 1839 from this locality, gave: FeO 35·93, Al_2O_3 55·63, MgO 8·01, MnO 0·52, S 0·08, H_2O 0·04 = 100·21. [The presence of magnetite having been proved by magnetic separation and by solubility in hydro-

chloric acid, and Fe_2O_3 not being determined, this analysis does not give the true composition of hercynite.] F. S.

Jirkovský (Rudolf). *Analysa dvou vodnatých síranů hlinitých z kyzových břidlic Valachovských.—Analyse chimique de deux sulfates d'alumine hydratés provenants des schistes pyritifères de Valachov.* Věstník Státního Geol. Ústavu Československé Republiky, 1926, vol. 2, pp. 209–214.

Analyses are given of: I alunogen, and II pickeringite, from the pyritic shales of Valachov hill near Skřivaň, Bohemia.

	SO_3.	Al_2O_3.	Fe_2O_3.	MnO.	MgO.	CaO.	H_2O.	Total.	Sp. gr.
I.	38·25	16·08	0·33	—	—	—	45·66	100·32	1·718
II.	36·43	13·53	0·72	trace	3·99	0·71	(44·62)	100·00	1·84

F. S.

Pacák (Oldřich). *Pektolit, nový minerál pro Republiku Československou. —La pectolite, nouveau minéral pour la République Tchécoslovaque.* Věstník Státního Geol. Ústavu Československé Republiky, 1926, vol. 2, pp. 235–241.

Pectolite fills small veinlets in a picritic rock near Libhošť in north-east Moravia, forming radiating groups of white fibres with silky lustre. Refractive index parallel length of fibre 1·632, across 1·600. Analysis V. Veselý gave SiO_2 52·73, Al_2O_3 0·50, Fe_2O_3 0·06, MgO 0·93, CaO 32·78, Na_2O 7·97, K_2O 0·13, H_2O (+105°) 4·70, H_2O (hygrosc.) 0·30, FeO, MnO, CO_2 nil, total 100·10. This gives the ratios $SiO_2 : CaO : Na_2O : H_2O = 7 : 5 : 1 : 2$, and the formula $2HNaCa_2Si_3O_9.CaSiO_3.H_2O$.

F. S.

[Kurbatov (S. M.)] Курбатов (С. М.). Везувианы из русских месторождений. II.—*Les vesuvianites des gisements russes. II.* Изв. Росс. Акад. Наук (Bull. Acad. Sci. Russie), 1922, ser. 6, vol. 16, pp. 411–424, 5 figs.

[—— & Solodovnikova (L. L.)] —— и Солодовникова (Л. Л.). —— *III.* Ibid., 1923, vol. 17, pp. 115–128, 3 figs.

[Kurbatov (S. M.).] —— *IV.* Ibid., 1924, vol. 18, pp. 151–174, 11 figs.

—— —— *V.* Ibid., 1925, vol. 19, pp. 43–52.

—— —— *VI.* Ibid., 1925, vol. 19, pp. 451–482, 12 figs.

The first paper of this series on the idocrases of Russia appeared in 1914 (ibid., vol. 8, pp. 901–914). II describes the chrome-idocrase

from the Serafimovsky (=Klyuchevsky) chromite mine on the Monetnaya estate, 56 versts N. of Ekaterinburg, Ural, which was discovered and briefly described by V. I. Kryzhanovsky in 1909. Associated minerals are serpentine, uvarovite, kämmererite, chlorite, perovskite, and leucoxene. The idocrase is either emerald-green or yellowish-green. The former occurs with chromite as well-developed crystals (18 forms are noted; $a:c = 1:0{\cdot}537332$); whilst the latter occurs with serpentine as very small crystals showing few forms. III, dark emerald-green chrome-idocrase from near the Verkh-Neivinsky works, 60 versts from Ekaterinburg, first mentioned by V. V. Nikitin in 1907; associated minerals are chromite, uvarovite, kämmererite, and chlorite; 26 forms are noted, $a:c = 1:0{\cdot}537375$. IV, Idocrase from Shishimsky Mt., Southern Ural, has often been described, first by G. Anosov in 1826. Here talc-schist and chlorite-schist are intruded by diorite. In the Shishimsky mine yellow crystals of idocrase occur with leuchtenbergite, blue calcite, and garnet. In the Veselkin and Gulenko mines the idocrase occurs in garnet-idocrase-rocks, usually as prismatic crystals but occasionally of tabular habit; 16 forms are noted, $a:c = 1:0{\cdot}537332$. V describes the mode of occurrence of idocrase in the asbestos mines on the borders of the Kamenskaya and Monetnaya estates, Ural, discovered by V. I. Kryzhanovsky in 1907. It forms chlorite-garnet-idocrase-rock or garnet-idocrase-rock, regarded as metamorphic equivalents of pyroxenite, which occurs as streaks in olivine-rock. VI describes the idocrase crystals from the last locality; 27 forms are noted, $c = 0{\cdot}53731$ to $0{\cdot}537375$. In each of these papers details are given of the characters of each form, the combinations of forms, tables of co-ordinate angles, and the light-figures are represented on the gnomonic projections. The form $s(311)$ is regarded as characteristic of chrome-idocrase. P. N. C.

[Chirva (E. F.)] Чирва (Е. Ф.). Крокоит из Березовского рудника близ Екатеринбурга на Урале.—Čirva (E.). *Sur la krokoite de Bérésowsk à l'Ural.* Труды Мин. Музея Акад. Наук СССР (Trav. Musée Min. Acad. Sci. URSS), 1926, vol. 1, pp. 43–67, 5 figs.

An historical sketch is given of crocoite from the Beresovsk mine, near Ekaterinburg. It was first mentioned by M. V. Lomonsov in his treatise on metallurgy (1763, vol. 1, p. 44) as a red lead-ore. Combinations of forms are stated for 21 measured crystals; of the 44 forms noted, four had not previously been observed for this locality. A table of co-ordinate angles is given; $a:b:c = 0{\cdot}91305:0{\cdot}960293:1$; $\beta = 77° 32' 55''$.
P. N. C.

Eckermann (Harry *von*). *The optical and physical properties of two Swedish muscovites.* Geol. För. Förh. Stockholm, 1927, vol. 49, pp. 229–234.

I, yellowish (colourless in thin section) muscovite from the pegmatite quarries at Finnbo, Dalecarlia; II, dull silvery muscovite from the Tenskog mines near Mansjö Mt.

	SiO_2.	Al_2O_3.	Fe_2O_3.	FeO.	MnO.	CaO.	MgO.	K_2O.	Na_2O.	F.
I.	44·77	35·36	0·28	2·13	0·15	0·00	0·87	10·81	0·95	0·15
II.	45 84	31·11	4·31	1·06	0·04	trace	1·10	9·66	2·27	0·15

	$H_2O(+110^c)$.	Total.	Sp. gr.	α_{Na}.	β_{Na}.	γ_{Na}.	$2V_{Na}$.	$a:c$.
I.	4·54	100·01	2·846	1·5628	1·5938	1·5988	43° 3′	18′
II.	4·49	100·03	2·809	1·559	1·595	1·600	40° 44′	5′

These analyses do not give simple ratios and the formulae are written as 91 $H_2KAl_3Si_3O_{12}$.9 $R'_4Si_2O_{12}$ and 87 $H_2KAl_3Si_3O_{12}$.13 $R'_4Si_2O_{12}$ respectively, where R′ = (H,K,Na) and (Fe,Mn,Mg). L. J. S.

Eppler (Wilhelm Friedrich). *Ueber das optische Verhalten, die Dichte und Zustandsänderungen des Zirkons.* Neues Jahrb. Min., Abt. A, 1927, Beil.-Bd. 55, pp. 401–487, 2 pls., 9 text-figs.; Diss. Hamburg, 1926; [Abstract:] Fortschr. Min. Krist. Petr., 1927, vol. 11, pp. 302–303.

Measurements were made of the refractive indices for light of wavelengths 708·20 to 404·66 $\mu\mu$ at temperatures ranging from 25° to 1440° C. of I blue zircon, II brown-red hyacinth, III naturally colourless zircon from Chantabun, Siam; IV brown-red hyacinth from Ceylon; V red hyacinth from Espaly, France; VI grey-brown from Tasmania; VII yellow-brown from Miask, Ural; VIII red-brown hyacinth from Laacher See, Rhineland; and IX yellow-green zircon of lower density with 2E 4° 16′ from Ceylon.

	Sp. gr.	ω_{Na} at 25° C.	ϵ_{Na} at 25° C.	ω_{Na} at 758° C.	ϵ_{Na} at 758° C.	Sp. gr. after heating.
I.	4·682	1·9251	1·9845	1·9380	1·9980	4·679
II.	4·680	1·9258	1·9848	1·9382	1·9980	4·671
III.	4·720	1·9253	1·9846	1·9376	1·9976	4·722
IV.	4·702	1·9251	1·9843	1·9381	1·9979	4·692
V.	—	1·9254	1·9845	—	—	—
VI.	4·707	1·9259	1·9851	—	—	—
VII.	4·702	1·9262	1·9851	—	—	—
VIII.	4·637	1·9292	1·9886	1·9445	2·0049	4·652
IX.	4·276	1·8784	1·8949	1·8842	1·9087	4·619

The first seven of these are normal β-zircon; the refractive indices show a linear increase with rise in temperature, and they return to the original values on cooling. In VIII there is a small sudden and reversible change in the refractive indices at 197° C. In IX the large increase in the refractive indices at 569° C. is not reversible on cooling. Some of the prisms showed zonal banding and gave only blurred refracted images; these generally disappeared on heating. Observations were made on the changes in colour when the zircons are heated or exposed to radium or ultra-violet rays. The blue zircon becomes pale-brown at 800–950° C., or when exposed to ultra-violet rays, and the blue colour is restored by heating the stone in hydrogen at 1060° C. The hyacinth from Siam becomes colourless at 400°, whilst that from Laacher See loses its colour between 157° and 307° C. Analysis by W. Geilmann and H. Rose of the blue zircon from Siam gave (mean of two) SiO_2 32·70, ZrO_2+HfO_2 67·42, TiO_2 0·02, CuO 0·15, Fe_2O_3 0·20, ZnO 0·02, CaO 0·13=100·64. The blue colour is attributed to copper and iron. L. J. S.

Adam (J. W. H.). *Covellin von Alghero in Sardinien.* Beitr. Kryst. Min., 1926, vol. 3, pp. 1–60, 3 pls., 27 text-figs.

A detailed crystallographic study of covelline from this locality, with brief descriptions of the associated pyrite and enargite. The thin yellow film on some of the covelline crystals is found to be chalcopyrite. Covelline is considered to be hexagonal (not monoclinic, as given by S. Stevanović, 1908), and the irregularities in the angles from the basal plane to the narrow pyramid faces at the edges of the plates are ascribed to irregularities of growth. From a large number of measurements the axial ratio is deduced as $a:c=1:2{\cdot}150$ ($cn=68°\ 4'$) and the more certain forms are c(0001), (10$\bar{1}$4), (10$\bar{1}$3), (20$\bar{2}$5), x(10$\bar{1}$2), l(20$\bar{2}$3), (40$\bar{4}$5), n(10$\bar{1}$1), (40$\bar{4}$3), (30$\bar{3}$2), y(20$\bar{2}$1), (40$\bar{4}$1). The surface characters and striations ('Schichtlinien') on the basal plane are represented in detail by photographs and sketches, and are regarded as forms of growth. L. J. S.

Pfeiffenberger (Arthur). *Mineralien aus dem Simplon-Tunnel.* Beitr. Kryst. Min., 1926, vol. 3, pp. 61–83, 5 pls., 24 text-figs.

Detailed crystallographic descriptions with pictures representing the surface characters are given of the following minerals from the Simplon tunnel in Switzerland: quartz, anatase, rutile, tourmaline, calcite, adu-

laria (Baveno-twins consisting of five individuals), gypsum, celestine, blende, pyrrhotine, pyrite, &c. L. J. S.

Klerk (A. de). *Über Eisenspat.* Beitr. Kryst. Min., 1926, vol. 3, pp. 85–103, 5 pls., 5 text-figs.

Twenty-one crystals of chalybite from various localities are described and figured in detail. Several are from 'Tincroft mine, St. Agnes, Cornw.' [Chalybite crystals are well known from Tincroft mine in Illogan parish, between Redruth and Camborne in Cornwall.] The forms noted are *c a e r f s v y β* [Dana's letters]. The list of 26 forms recorded for chalybite is discussed, and only the ones given above and $M(40\bar{4}1)$ are regarded as certain. Twins on $e(01\bar{1}2)$ are described from Redruth, Cornwall, and this is said to be the only twin-law for chalybite [cf. Min. Mag., vol. 14, p. 343]. Crystals from Osnabrück, 'Westphalia' [i.e. Hanover], gave analysis I, and saddle-shaped crystals on quartz and haematite from [the iron-mines of west] Cumberland gave II.

	FeO.	MnO.	CaO.	MgO.	CO_2.	Insol.	Total.	Sp. gr.
I.	53·13	1·87	0·46	4·93	39·60	—	99·99	3·75
II.	52·58	0·0	8·19 [?]	0·0 [?]	38·37	0·86	[100·00]	—

L. J. S.

Palache (Charles) & Berman (Harry). *Crystallographic notes: 1. phosphophyllite; 2. hematite; 3. willemite; 4. hedyphane.* Amer. Min., 1927, vol. 12, pp, 180–187, 7 figs.

A new orientation is selected for the crystals of phosphophyllite from Hagendorf, Bavaria [Abstr., vol. 1, p. 125; vol. 3, p. 274], the cleavage and twin-plane $c(001)$ being taken as (100) and $a(100)$ as $(\bar{1}02)$. Axial ratios deduced from new measurements are $a : b : c = 2{\cdot}079 : 1 : 2{\cdot}026$, $\beta = 59° 35'$. The optical orientation in the new position is $\gamma = b$, $a(Bx_a)$ nearly normal to $c(100)$, $\beta : a = 50°$; 2V about 50°, α 1·594, β 1·614, γ 1·616. Haematite as minute brilliant cuboidal crystals from Franklin, New Jersey, show the forms *r c e n z* χ ψ *P* [Dana] with *r* predominating. Willemite from Franklin, N.J., as tiny white scales of thin-tabular habit (*c e r a*). Pure colourless crystals of willemite gave on analysis by L. H. Bauer SiO_2 26·55, ZnO 72·11, FeO 0·075, MnO 0·12, MgO 0·13, Al_2O_3 1·00; ω 1·691, ϵ 1·719 (white light). Hedyphane from Franklin, N.J. [Abstr., vol. 3, p. 218], shows the forms *c m x v s* [Dana's letters for apatite] and gave by the prism method ϵ 1·958, ω 1·948 (Na). L. J. S.

Palache (Charles) & Lewis (Lyman W.). *Crystallography of azurite from Tsumeb, Southwest Africa, and the axial ratio of azurite.* Amer. Min., 1927, vol. 12, pp. 99–143, 42 figs. (in text and on 9 pls.).

The material described was selected from a series of over 1,500 specimens of chessylite from Tsumeb, South-West Africa. Several types of habit of the crystals are distinguished, and 26 forms noted on the crystals measured. The axial ratios are deduced as $a : b : c = 0{\cdot}8565 : 1 : 0{\cdot}8844$, $\beta = 87° 35'$, and a table of calculated co-ordinate angles given for the 130 known forms of chessylite. These values also agree with measurements made on chessylite crystals from Chessy in France, Bisbee in Arizona, Laurion in Greece, Kelly mine in New Mexico, Broken Hill in New South Wales, and Copiapó in Chile. Tables of forms and combinations of forms are given for each of these and several new forms are listed [but the letters and indices are not always consistent with those given in the main table and on the projection]. Pseudomorphs of malachite after chessylite are described; on some of these there has been a later growth of unaltered chessylite in parallel position with the original crystal. Several photographic reproductions of crystals are covered with a tracing of the outlines. L. J. S.

Palache (Charles). *The occurrence of cinnabar in Dutch Guiana.* Amer. Min., 1927, vol. 12, pp. 188–189.

Pebbles and grains of cinnabar are found in the gold placers of the Marowyne district near the head of the Tempati river, with magnetite, ilmenite, and monazite. Thin veins of cinnabar are found in associated boulders of laterite. A single pebble from the same district consists of quartz and bluish-green granular serendibite. L. J. S.

Billings (Marland P.). *Topaz and phenacite from Baldface Mountain, Chatham, New Hampshire.* Amer. Min., 1927, vol. 12, pp. 173–179, 5 figs.

A crystallographic study of a large series of crystals of topaz and phenakite from cavities in the miarolitic biotite-granite of South Baldface Mountain. On topaz 24 crystal forms are noted, including a series of narrow pyramid faces grouped around $f(021)$, viz. $\mathfrak{A}(1.11.6)$, $\mathfrak{D}(2.18.9)$, $\mathfrak{F}(2.24.11)$, $\mathfrak{H}(2.30.13)$, the last three of which are new for topaz. On the lenticular crystals of phenakite 16 forms were observed. L. J. S.

Berman (Harry). *Graftonite from a new locality in New Hampshire.* Amer. Min., 1927, vol. 12, pp. 170–172, 1 pl.

Clear brown graftonite (α 1·704, β 1·706, γ 1·725) interlaminated with deep purple heterosite (α 1·85, β 1·86, γ 1·91) has been found in abundance with triphylite, &c., on the old dump of the Palermo mica mine on Bald Face Mountain, near North Groton. A pseudomorph of heterosite after triphylite is noted from the Valencia mine. L. J. S.

Berman (Harry). *The optical properties of zincite from Franklin, New Jersey.* Amer. Min., 1927, vol. 12, pp. 168–169, 1 fig.

A pure zincite [colour, density, and whether natural or artificial, not stated] gave ZnO 99·63, MnO 0·27, FeO 0·01, SiO_2 0·08 = 99·99. Refractive indices determined by the prism method are : ϵ 2·004, ω 1·989 (for $\lambda = 675\mu\mu$); ϵ 2·029, ω 2·013 (Na); ϵ 2·056, ω 2·039 ($\lambda = 530$). L. J. S.

Gaubert (Paul). *Sur l'eisenbrucite.* Bull. Soc. Franç. Min., 1925, vol. 48, pp. 216–219.

A specimen labelled 'Eisenbrucit' [though not the original material of F. Sandberger, 1880] was found to be optically negative (ω 1·564, ϵ 1·548) rather than positive and with lower sp. gr. (2·18–2·22) than brucite. It is therefore suggested that this mineral is a carbonate rather than a hydroxide, and belongs to the hydrotalcite group [Abstr., vol. 1, p. 175]. Petersen's original analysis is interpreted as $7(Mg,Fe)O.CO_2.10H_2O$. L. J. S.

Flink (Gust.). *Om sarkinit från Långban, ett för fyndorten nytt mineral.* Geol. För. Förh. Stockholm, 1924, vol. 46, pp. 661–670, 2 figs.

Sarkinite, previously known only from Pajsberg, has been found at Långban as flesh-red crystals in crevices in the hausmannite ore. They are richer in faces than the Pajsberg crystals, showing the forms $a(100)$, $b(010)$, $c(001)$, $m(110)$, $p(021)$, $s(032)$, $q(011)$, $e(\bar{1}01)$, $d(\bar{2}01)$, $f(\bar{3}01)$, $k(\bar{2}11)$, $l(\bar{4}32)$, $g(421)$, $h(821)$ [$a : b : c = 2·0013 : 1 : 1·5154$, $\beta = 62° 14'$]. Optic axial plane (010), $\gamma : c = +37°$, negative, α 1·7930, β 1·8065, γ 1·8085. Sp. gr. 4·178, 4·173. Analysis by G. K. Almström, As_2O_5 42·55, MnO 50·60, FeO 0·15, CaO 1·09, MgO 0·29, Na_2O 1·30, H_2O 3·44, Al_2O_3 0·10, insol. 0·14 = 99·66, gives the formula $4MnO.As_2O_5.H_2O$. L. J. S.

Bellière (M[arcel]). *Note sur des minéraux du houiller.* Ann. Soc. Géol. Belgique, 1927, vol. 49, Bull. pp. B 267–B 274.

A carbonate (usually referred to dolomite or chalybite) is found with quartz, pyrite, pholerite, and calcite in crevices in the shales of certain Belgian collieries. The following analyses prove this to be ankerite; cleavage angle 106° 4′.

	$FeCO_3$.	$MnCO_3$.	$CaCO_3$.	$MgCO_3$.
I.	20·88	7·79	49·87	21·46
II.	28·60	0·65	49·96	20·79
III.	25·72	0·69	51·98	21·61
IV.	27·11	1·51	60·58	10·80

Ozokerite was found in quartz crystals in a clay-ironstone nodule. Chalcedonite and quartzine fibres were recognized in a flinty silica in the interior of a dolomite nodule. L. J. S.

Bach (Ludwig). *Ueber Wulfenit.* Neues Jahrb. Min., Abt. A, 1926, Beil.-Bd. 54, pp. 380–419, 2 pls., 5 text-figs.

Descriptions are given of 36 crystals of wulfenite from various localities. The surface characters and forms of growth are figured in detail and show indications of hemihedrism and hemimorphism; the latter being further supported by twinning on (001) [Abstr., vol. 3, p. 156]. A new form $\Sigma(119)$ is noted [axes $a:c=1:1{\cdot}5774$]. Combinations of forms are listed, and the relative frequency and size of the faces noted. A discussion of the forms of wulfenite leaves a list of 30 typical forms, 7 vicinal or marginal (including (7.1.75)), and 7 uncertain. L. J. S.

Ito (T.). *Die Kristallisationsverhältnisse von Arakawait.* Zeits. Krist., 1927, vol. 65, pp. 305–308, 4 figs.

New measurements of crystals of arakawaite from Japan [cf. Abstr., vol. 3, p. 269] gave $a:b:c=0{\cdot}738:1:0{\cdot}956$, $\beta=76°\ 10'$. Arakawaite and veszelyite no doubt belong to the same isomorphous series. L. J. S.

Smith (T. Hodge). *Mineralogical notes no. 3.* Rec. Australian Museum, 1927, vol. 15, pp. 313–320, 4 pls.

Large crystals of calcite have been found in the Garibaldi gold-mine, Lionsville, New South Wales. Some of the smaller crystals are quite transparent. Several crystals were measured and 17 forms noted. Calcite crystals from Hanging Rock, Nundle, N.S.W., are also described. L. J. S.

Schoep (Alfred). *Présence d'or natif et de linnéite sélénifère dans la pechblende du Katanga.* Ann. Soc. Géol. Belg. Publ. Congo Belge, 1927, vol. 49 (for 1926), pp. c 27–c 28.

Specks of native gold were found in pitchblende in association with linnaeite. The latter occurs in veins and grains in the pitchblende, sometimes in abundance; sp. gr. 4·31 ; analysis gave S 36·01, Se 4·69, Co 51.04, Ni 2·81, Fe 0·75, Mo 5.01. The material appeared to be homogeneous when examined in polished sections. L. J. S.

Zechmeister (László). *Adatok az ajkait, egy hazai fosszilis gyanta ismeretéhez.* [Summary :] *Zur Kenntnis des Ajkaits, eines fossilen Harzes aus Ungarn.* Math. Természettud. Értesítő, Budapest, 1926, vol. 43, pp. 332–340 (Hung.), p. 341 (Germ.).

Zechmeister (László) & Vrabély (Vera). *Notiz über Ajkait (ein organisches Mineral aus Ungarn).* Ber. Deutsch. Chem. Gesell., 1926, vol. 59, Abt. B, pp. 1426–1428.

Ajkaite occurs as irregular masses in Cretaceous lignite near Ajka, com. Veszprém, Hungary. The colour is honey-yellow to reddish-brown, transparent to translucent, fracture conchoidal, H. $2\frac{1}{2}$, D^{20} 1·05–1·06, n_D 1·5412 at 18° C. (determined by Mária Vendl), powder nearly white. It develops negative electricity when rubbed. It softens at 205° C. and becomes brownish-grey and sticky at 240°; honey-like at 285°, and distillation of a dark-coloured 'ajkaite-oil' with penetrating odour commences at 300°. The material is not chemically homogeneous and is not readily soluble. Alcohol extracts 0·4%, carbon bisulphide 0·8%, chloroform and pyridine about 4%. It is slowly and completely soluble in cajuput oil. Analyses of light (I) and dark (II) coloured material gave :

	C.	H.	O.	S.	N.	Ash.
I.	80·38	11·00	7·20	1·42	nil	nil
II.	79·01	9·89	9·61	1·49	nil	nil

Ajkaite is a distinct variety of fossil resin with a characteristic amount of sulphur and no succinic acid. K. Z.

Vendl (Mária). *Kristálytani vizsgálatok magyarországi kalcitokon.* [Summary :] Vendl (Marie). *Kristallographische Untersuchungen an ungarischen Kalziten.* Math. Természettud. Értesítő, Budapest, 1926, vol. 43, pp. 255–263 (Hung.), pp. 264–265 (Germ.), 1 fig.

A preliminary account of a detailed study of calcite crystals from various Hungarian localities. (1) Vaskő, com. Krassó-Szörény.—The crystals vary in habit, being prismatic, rhombohedral, scalenohedral, or tabular, and in their combinations of forms. The more common forms

are $\phi \cdot \delta \cdot p \cdot$. The usual twin-plane is (0001); scalenohedral crystals are rarely twinned on $(01\bar{1}2)$ and $(10\bar{1}1)$. The forms observed are *o b p· m· n· δ· ρ· N· φ· Γ· ϱ· Θ· Ξ· Π· Φ· Ψ· x: v: K: N: O: P:* ọ: ẉ: ṗ: [Goldschmidt's letters], and D: (2.13.$\bar{1}$5.4), $\mathfrak{K}$ (16$\bar{7}$2), $\mathfrak{R}$ (3.9.$\bar{1}$2.4). The last three forms are new; (2.13.$\bar{1}$5.4) lies in the zone $[(2\bar{1}\bar{1}0), (07\bar{7}2)]$. (2) Dognácska, com. Krassó-Szörény.—Forms *o b p· m· δ· φ· ψ· Λ·* ṗ:. Crystals from the Archangel mine are colourless, thin-tabular, and often twinned on (0001). From the Elias Enoch mine the predominating form is (09$\bar{9}$2). Crystals from the Márkus mine are scalenohedral with (13$\bar{4}$1) predominating. (3) Szászkabánya, com. Krassó-Szörény.—The crystals are usually prismatic, rarely rhombohedral, the latter being interpenetration-twins on (0001). Forms *b q p· k· m· δ· φ· z: y: n: K: N:*, $\mathfrak{P}$ (10.6·$\bar{1}$6.7), the last a new form in the zones $[(01\bar{1}2), (21\bar{3}1)]$ and $[(0.11.\bar{1}1.7), (2\bar{1}\bar{1}0)]$. Prismatic crystals of different diameters are grown in parallel position with a common vertical axis. (4) Újmoldova, com. Krassó-Szörény.—The crystals are scalenohedral, (21$\bar{3}$1) predominating, with the forms *b π p· m· δ· π· N· φ· ω· Ψ· h: e: K: N:*. Twins on (0001) and $(01\bar{1}2)$. (5) Rézbánya, com. Bihar.—Well-developed crystals of different habits are associated with yellowish-red stilbite and show the forms *b p· δ· φ· K: M:*. Twins on (0001). (6) Aranyosbánya, com. Torda-Aranyos.—Colourless or pale-rose crystals with the forms *b δ· φ· p·*. K. Z.

Zambonini (Ferruccio) & Carobbi (Guido). *Ricerche chimiche sulle incrostazioni gialle della lava vesuviana del 1631.* Atti R. Accad. Sci. Fis. Mat. Napoli, 1926, ser. 2, no. 10, 26 pp., 1 pl.

Zambonini (F.) & Carobbi (G.). *A chemical study of the yellow incrustations on the Vesuvian lava of 1631.* Abstract by Henry S. Washington. Amer. Min., 1927, vol. 12, pp. 1–10.

A new analysis made on the original material described by A. Scacchi in 1879 as 'vesbine' gave for the portion soluble in dilute nitric acid, after deducting 13% sodalite, CuO 19·52, MnO 0·33, PbO 44·34, V_2O_5 19·52, P_2O_5 0·28, As_2O_5 0·30, MoO_3 0·71, H_2O 15·00, corresponding with the formula $(Pb,Cu)_3V_2O_8.(Pb,Cu)(OH)_2.6\frac{1}{2}H_2O$, or $5H_2O$ for material dried over calcium chloride at 25°, or $3H_2O$ dried at 110°. This composition indicates a hydrated cuprodescloizite. Spectroscopic analysis showed the presence also of Ti, W, Cr, Zn, and rare-earths; and definitely proved the identity of 'vesbium' with vanadium. The mineral forms a very thin coating in crevices, and was perhaps formed by the action of a solution of alkali vanadate (derived from exhalations of the lava) on lead and copper minerals. L. J. S.

Flink (Gust.). *Om svabit från Långban, ett för fyndorten nytt mineral.* [On svabit from Långban, a new mineral for this locality.] Geol. För. Förh. Stockholm, 1925, vol. 47, pp. 127–134, 2 figs.

Svavite, previously known only from the Harstig mines, Sweden, has been found at Långban in iron ore with haematite, mica, and garnet. The colourless short-prismatic crystals show bipyramidal hemihedrism with the apatite forms *c m x r y s v h* [Dana's letters], *e* (21$\bar{3}$1) and *p* (41$\bar{5}$2); $cm = 50°37'$, $a : c = 1 : 0{\cdot}71094$. Sp. gr. 3·695, *H.* 4–5. Analysis by G. K. Almström gave As_2O_5 50·60, Sb_2O_5 0·55, P_2O_5 2·72, Al_2O_3 0·34, CaO 42·68, MgO 0·56, Na_2O 1·24, K_2O 0·37, Cl 0·54, F (n. d.) H_2O (ign.) 2·28, insol. 1·00, total 102·88. This gives a formula, (Cl,F,OH) $Ca_5As_3O_{12}$, analogous to that of apatite, with which the mineral is isomorphous. L. J. S.

Jong (W. F. de). *Het minerale bestanddeel van beenderen.* Verslag Afd. Natuurk. K. Akad. Wetensch. Amsterdam, 1926, vol. 35, pp. 439–442, 1 fig. [Translation:] *On the mineral component of bones.* Proc. Sect. Sci. K. Akad. Wetensch. Amsterdam, 1926, vol. 29, pp. 870–872, 1 fig.

The constant ratio $Ca_3(PO_4)_2 : CaCO_3$ in recent bones suggests the compound $3Ca_3(PO_4)_2.CaCO_3$ corresponding with podolite and dahllite. X-ray powder photographs of recent and fossil bones and of staffelite and osteolite show the same lines as apatite, though somewhat blurred. Collophanite gives different lines. L. J. S.

Mügge (O.). *Zur Kenntnis des Kaliophilit.* Zeits. Krist., 1927, vol. 65, pp. 380–390, 10 figs.

Amongst the large series of nephelines in the ejected blocks from Monte Somma, Vesuvius, in the Göttingen collection were two specimens on which the crystals were distinguished by a milky-white appearance. These show only the forms (10$\bar{1}$0) (0001) with cleavages (or separation) in the same directions. They have sp. gr. 2·61 (for the glassy nepheline 2·59), ω 1·5316, ϵ 1·5273 (yellow), and are optically unaxial and negative. Analysis by N. Sahlbom gave SiO_2 39·04, Al_2O_3 31·96, Fe_2O_3 0·98, CaO 0·33, MgO 0·15, K_2O 22·84, Na_2O 3·89, $H_2O(+105°)$ 0·60, S, Cl, CO_2 nil = 99·79, agreeing with the formula $KAlSiO_4$, and proving the material to be kaliophilite. The cloudiness is due to fissures and inclusions, which are described in some detail. The 'nepheline' crystals rich in faces on which N. I. Koksharov (1885) determined the axial ratios accepted for nepheline were also from the Göttingen collection. Similar crystals are now found to have sp. gr. 2·487 (2·492), ω_{Na} 1·5235 (1·5237), ϵ_{Na} 1·5287 (1·5282) and they contain chlorine. They are considered to be davyne. L. J. S.